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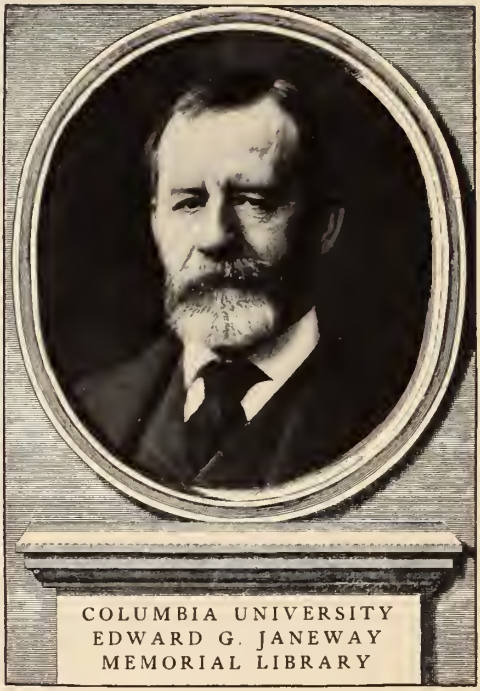

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TRANSACTIONS

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

FOR THE YEAR 1910.

VOLUME XXVI.

"The object of this Association shall be the study of Climatology and Hydrology and of Diseases of the Respiratory Organs." – *Constitution.*

PHILADELPHIA:

PRINTED FOR THE ASSOCIATION.

1910.

NOTICE.

The Association assumes no responsibility for the statements and opinions expressed in the papers read at its meetings.

OFFICERS OF THE ASSOCIATION,

1910—1911.

President.

EDWARD R. BALDWIN, M.D., Saranac Lake, N.Y., 1910.
JOHN WINTERS BRANNAN, M.D., New York City, 1911.

Vice-Presidents.

J. M. ANDERS, M.D., Philadelphia, 1910.
H. L. TAYLOR, M.D., St. Paul, 1910.
WILLIAM H. SWAN, M.D., Colorado Springs, 1911.
JOHN H. LOWMAN, M.D., Cleveland, 1911.

Secretary and Treasurer.

GUY HINSDALE, M.D., Hot Springs, Va.

Council.

E. L. SHURLY, M.D., Detroit.
THOMAS DARLINGTON, M.D., New York City.
THOMAS D. COLEMAN, M.D., Augusta, Ga.
CHARLES E. QUIMBY, M.D., New York City.
EDWARD R. BALDWIN, M.D., Saranac Lake.

Representative on the Executive Committee of the Congress of American Physicians and Surgeons.

ROLAND G. CURTIN, M.D., Philadelphia.
THOMAS DARLINGTON, M.D., New York, *Alternate.*

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LIST OF OFFICERS.

Presidents.

NAME	YEAR
A. L. Loomis	1884–5
William Pepper	1886
Frank Donaldson	1887
A. L. Loomis	1888
V. Y. Bowditch	1889
Charles Denison	1890
F. I. Knight	1891
W. E. Ford	1892
R. G. Curtin	1893
A. H. Smith	1894
S. E. Solly	1895
J. B. Walker	1896
E. Fletcher Ingals	1897
E. O. Otis	1898
Beverley Robinson	1899
Abraham Jacobi	1900
Robert H. Babcock	1901
Samuel A. Fisk	1902
Norman Bridge	1903
James C. Wilson	1904
W. F. R. Phillips	1905
E. L. Shurly	1906
Thomas Darlington	1907
Thomas D. Coleman	1908
Charles E. Quimby	1909
Edward R. Baldwin	1910
John Winters Brannan	1911

Vice-Presidents.

F. I. Knight, W. H. Geddings	1884–5
Frank Donaldson, Beverley Robinson	1886

NAME	YEAR
V. Y. Bowditch, R. G. Curtin	1887
A. Y. P. Garnett, J. T. Whittaker	1888
J. R. Leaming, E. T. Bruen	1889
A. L. Gihon, H. B. Baker	1890
E. L. Trudeau, T. S. Hopkins	1891
E. Fletcher Ingals, Beverley Robinson	1892
A. H. Smith, E. O. Otis	1893
I. Hull Platt, E. L. Trudeau	1894
John H. Musser, G. R. Butler	1895
Charles E. Quimby, James A. Hart	1896
S. A. Fisk, John C. Munro	1897
Beverley Robinson, C. F. McGahan	1898
James A. Hart, R. C. Newton	1899
R. H. Babcock, J. W. Brannan	1900
Albert C. Peale, S. W. Langmaid	1901
Norman Bridge, W. F. R. Phillips	1902
James C. Wilson, H. S. Orme	1903
Thomas Darlington, Thomas D. Coleman	1904
S. G. Bonney, S. D. Risley	1905
A. D. Blackader, Henry Sewall	1906
Frank Fremont-Smith, C. L. Minor	1907
Judson Daland, Charles Fox Gardiner	1908
E. R. Baldwin, C. E. Edson	1909
James M. Anders, H. Longstreet Taylor	1910
Will Howard Swan, John H. Lowman	1911

Secretaries and Treasurers.

James B. Walker	1884–95
Guy Hinsdale	1895–

LIST OF MEMBERS.

Honorary Members.

ELECTED

1885. Bell, A. N., 337, Clinton Street, Brooklyn, New York.
*1888. Nunn, R. J., 5, York Street, E., Savannah, Ga.
O. M. Orme, H. S., 214, Douglas Building, Los Angeles, Cal.
O. M. Schauffler, Edward W., Kansas City, Missouri.
O. M. Robinson, Beverley, 42, West 37th Street, New York.
1885. Trudeau, Edward L., Saranac Lake, New York.
O. M. Tyndale, J. Hilgard, Richards Block, Lincoln, Nebraska.
1897. Weber, Sir Hermann, 10, Grosvenor Street, W., London, England.
1906. Weber, Leonard, 132, West 73rd Street, New York.
1897. Williams, Charles Theodore, 2, Upper Brook Street, W., London, England.

Corresponding Members.

1898. Eyre, G. G., Claremont, Cape Town, South Africa.
1910. Forbes, Mr. N. Hay, F.R.C.S., Church Stretton, England.
1910. Lamb, George, Indian Medical Service, Parel, Bombay, India.
1898. Liceaga, Eduardo, Ca. de Napoles, Numero 37, Mexico.
1908. Liston, W. Glen, D.P.B., Capt., Indian Medical Service, Parel, Bombay Bacteriological Laboratory, Bombay, India.
1898. Orvananos, Domingo, 25, Chavarri Street, Mexico.
1910. Rogers, Leonard, I.M.S., F.R.C.S., School of Medicine, Calcutta, India.
1904. Sandwith, Fleming Mant, 31, Cavendish Square, W., London.
1898. Sunderland, Septimus, 11, Cavendish Place, Cavendish Square, W., London.
1902. Weber, F. Parkes, 19, Harley Street, W., London.
1907. Wellman, F. Creighton, care of H. K. Lewis, 136, Gower Street, W.C., London.
1907. Williams, Leonard, 123, Harley Street, W., London.

Deceased.

Active Members.

ELECTED

1888. Abbot, Griffith E., Leominster, Mass.
1897. Alton, Charles D., 86, Farmington Avenue, Hartford, Conn.
1898. Anders, Howard S., 2035, Walnut Street, Philadelphia.
1899. Anders, James M., 1605, Walnut Street, Philadelphia.
1890. Anderson, B. P., 106, N. Cascade Avenue, Colorado Springs, Col.
1900. Arnold, Horace D., 427, Beacon Street, Boston.

1893. Babcock, R. H., 92, State Street, Chicago.
1898. Baldwin, Edward R., Saranac Lake, N.Y.
1901. Barlow, W. Jarvis, Security Building, Los Angeles, Cal.
1907. Barnes, Harry Lee, Wallum Lake, R.I.
1902. Bergtold, William H., 1460, Clayton Street, 610, California Building, Denver, Col.
1906. Billings, John S., jun., 32, East 53rd Street, New York City.
1897. Blackader, Alexander D., 236, Mountain Street, Montreal, Canada.
1895. Boardman, W. S., 63, Mt. Vernon Street, Boston.
1897. Bonney, S. G., Stedman Building, Denver, Col.
O. M. Bosworth, Francke H., 41, Park Ave., New York City.
1885. Bowditch, V. Y., 506, Beacon Street, Boston.
1901. Bracken, Henry Martyn, 1010, Fourth Street, Minneapolis, Minn.
1891. Brannan, John W., 11, West 12th Street, New York City.
1894. Bridge, Norman, Temple Auditorium, Los Angeles, Cal.
1903. Brown, Lawrason, Saranac Lake, N.Y.
1903. Brown, Philip King, 2527, Fillmore Street, San Francisco, Cal.
1897. Brown, Sanger, Reliance Building, Chicago.
1907. Browning, Charles C., Monrovia, Cal.
1909. Bushnell, George E., U.S.A., Fort Bayard, New Mexico.
1886. Butler, G. R., 229, Gates Avenue, Brooklyn.

1896. Campbell, W. A., 424, N. Nevada Ave., Colorado Springs, Col.
1898. Casselberry, W. E., 34, Washington Street, Chicago, Ill.
1910. Carrington, P. M., U.S.M.H. and P.H. Service, San Diego, Cal.

ELECTED
1898. CHAPPELL, WALTER, F., 7, East 55th Street, New York.
1906. CLAYTOR, THOMAS A., 1315, New Hampshire Avenue, Washington, D.C.
1898. CLEEMANN, RICHARD A., 2135, Spruce Street, Philadelphia.
1901. COBB, J. O., U.S.M.H.S., 403, Iron Block, Milwaukee, Wis.
1894. COLEMAN, THOMAS D., 505, Greene Street, Augusta, Ga.
1901. COLLINS, CHARLES FARNHAM, 50, West 55th Street, New York City.
1889. COOLIDGE, A., jun., 613, Beacon Street, Boston.
1902. CRAIG, R. W., Phœnix, Arizona.
1910. CRANE, BAYARD T., Rutland, Mass.
1885. CURTIN, R. G., 22, South 18th Street, Philadelphia.
1907. DA COSTA, JOHN C., jun., 1022, Spruce Street, Philadelphia.
1892. DALAND, JUDSON, 317, South 18th Street, Philadelphia.
1890. DARLINGTON, THOMAS, The Lotus Club, West 57th Street, New York City.
1907. DARNALL, WM. EDGAR, 1704, Pacific Ave., Atlantic City.
1897. DAVIS, N. S., 72, East Madison Street, Chicago.
1906. DAWSON, JOHN L., Charleston, S.C.
1905. DUNN, WILLIAM LEROY, Asheville, N.C.
1910. DIXON, SAMUEL G., Harrisburg, Penn.

1897. EDSON, CARROLL E., McPhee Building, Denver, Col.
1903. EDWARDS, WILLIAM, A., Security Building, Los Angeles, Cal.
1903. ELLIOTT, J. H., 611, Spadina Ave., Toronto, Canada.
1892. ELSNER, H. L., Fayette Park, Syracuse, N.Y.

1887. FISK, SAMUEL A., Brimfield, Mass.
1910. FLOYD, CLEAVELAND, 1398, Beacon Street, Boston, Mass.
1885. FORD, WILLIS E., 266, Genesee Street, Utica, N.Y.

1896. GARDINER, C. FOX, 818, North Cascade Avenue, Colorado Springs, Col.
1886. GARNETT, A. S., Hot Springs, Ark.
1898. GETCHELL, ALBERT C., 6, Linden Street, Worcester, Massachusetts.
1892. GIBSON, WILLIAM M., 260, Genesee Street, Utica, N.Y.
1909. GRIFFIN, WALTER ALDEN, Sharon, Mass.

ELECTED

1907. HALL, J. N., Jackson Building, Denver, Col.
1893. HANCE, I. H., Lakewood, N.J.
1891. HART, JAMES A., Geneva, N.Y.
1900. HARVEY, THOMAS W., 463, Main Street, Orange, N.J.
1896. HEFFRON, JOHN L., 528, South Salina Street, Syracuse, N.Y.
1893. HINSDALE, GUY, Hot Springs, Va.
1902. HOAGLAND, HENRY W., 818, North Nevada Avenue, Colorado Springs, Col.
1905. HUDDLESTON, JOHN H., 145, West 78th Street, New York.

O. M. INGALS, E. FLETCHER, 34, Washington Street, Chicago.

1889. JACOBI, A., 19, East 47th Street, New York.
1904. JACOBS, HENRY BARTON, 11, Mt. Vernon Place, W., Baltimore.
1888. JAYNE, W. A., 416 McPhee Building, Denver, Col.
1901. JENNINGS, CHARLES GODWIN, 457, Jefferson Street, Detroit, Michigan.

1910. KAHLO, GEORGE D., French Lick, Indiana.
1904. KING, HERBERT MAXON, Liberty, New York.
1907. KINGHORN, HUGH M., 14, Church Street, Saranac Lake, N.Y.
1899. KLEBS, ARNOLD C., care of Munroe and Co., 3, Rue Scribe, Paris, France.
1903. KYLE, D. BRADEN, 1517, Walnut Street, Philadelphia.

1910. LANDIS, H. R. M., 11, South 21st Street, Philadelphia.
1887. LANGMAID, S. W., 277, Dartmouth Street, Boston.
1899. LE FEVRE, EGBERT, 52, West 56th Street, New York.
1903. LINDLEY, WALTER, 1414, South Hope Street, Los Angeles, Cal.
1904. LITTLE, WILBUR T., Canon City, Col.
1909. LOCKE, EDWIN ALLEN, 311, Beacon Street, Boston, Mass.
1904. LOWMAN, JOHN H., 1807, Prospect Ave., S.E., Cleveland, O.
1907. LYMAN, DAVID RUSSELL, Wallingford, Conn.

1902. MCBRIDE, JAMES H., Pasadena, Cal.
1909. MAKUEN, GEORGE HUDSON, 1627, Walnut Street, Philadelphia.
1906. MANGES, MORRIS, 72, East 79th Street, New York.
1910. MARCY, ALEXANDER, Riverton, N.J.

ELECTED

1902. MARVEL, PHILIP, 1616, Pacific Avenue, Atlantic City, N.J.
1887. MAYS, THOMAS J., 1829, Spruce Street, Philadelphia.
1905. MILLER, JAMES ALEXANDER, 18, West 51st Street, New York.
1909. MINER, CHARLES H., 115, South Franklin Street, Wilkes-barre, Pa.
1909. MINER, STANLEY G., 58, Cadillac Square, Detroit, Mich.
1899. MINOR, CHARLES L., Asheville, N.C.
1909. MORGAN, JAMES DUDLEY, 919, Fifteenth Street, N.W., Washington, D.C.
1886. MUSSER, JOHN H., 1,927, Chestnut Street, Philadelphia.

1900. NAMMACK, CHARLES E., 42, East 29th Street, New York.
1895. NEWTON, R. C., 42, Church Street, Montclair, N.J.
1907. NICHOLS, ESTES, Y.M.C.A. Building, Portland, Maine.
1907. NICHOLS, JOHN B., 1321, Rhode Island Ave., N.W., Washington, D.C.
1899. NORRIE, V. H., 21, West 37th Street, New York.

1888. OTIS, E. O., 381, Beacon Street, Boston.

1887. PEALE, A. C., 605, 12th Street, N.W., Washington, D.C.
1906. PERKINS, JAY, 106, Waterman Street, Providence, R.I.
1895. PHILLIPS, W. F. R., 1607, 16th Street, N.W., Washington, D.C.
1887. PLATT, WALTER B., 802, Cathedral Street, Baltimore.
1902. POTTENGER, F. M., O. T. Johnson Building, Los Angeles, Cal.
1905. PRATT, JOSEPH H., 313, Beacon Street, Boston.
1905. PRYOR, JOHN H., 26, Linwood Ave., Buffalo, New York.

1891. QUIMBY, CHARLES E., 278, West 86th Street, New York.

*1891. RANSOM, C. C., 66, West 49th Street, New York.
O. M. REED, BOARDMAN, Alhambra, Los Angeles Co., Cal.
1885. RICE, C. C., 123, East 19th Street, New York.
1901. RICHARDSON, CHARLES W., 1317, Connecticut Avenue, Washington, D.C.
1904. RICHER, A. J., Ste. Agathe des Monts, Province of Quebec, Canada.
1890. ROBINSON, W. D., 2012, Mount Vernon St., Philadelphia.
1902. ROCHESTER, DELANCEY, 469, Franklin Street, Buffalo, N.Y.

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* Died September 13, 1910.

ELECTED

1892. Roe, John O., 44, South Clinton Street, Rochester, N.Y.
1890. Rogers, E. J. A., 222, Colfax Avenue, Denver, Col.
1889. Ruck, Carl von, Asheville, N.C.

1905. Schauffler, William Gray, 400 Madison Ave., Lakewood, N.J.
1901. Sewall, Henry, 433-4, Majestic Building, Denver, Col.
1910. Shurly, B. R., 32, Adams Avenue W., Detroit, Mich.
O. M. Shurly, E. L., 32, Adams Avenue, W., Detroit, Mich.
1890. Smith, A. Alexander, 18, West 51st Street, New York.
1887. Smith, Frank Fremont, 1808, Massachusetts Ave., Washington, D.C.
1909. Stevens, Martin L., Asheville, N.C.
1904. Stone, Arthur K., 543, Boylston Street, Boston, Mass.
1898. Stubbert, J. Edward, 238, W. 73rd Street, New York.
1901. Swan, Will Howard, 1440, North Nevada Avenue, Colorado Springs, Col.
1910. Swan, John M., Glen Springs, N.Y.

1892. Taylor, H. Longstreet, 75, Lowry Arcade, St. Paul, Minn.
1907. Taylor, J. Gurney, 6041, Drexel Road, Philadelphia.
1896. Taylor, J. Madison, 1504, Pine Street, Philadelphia.
1910. Thomas, John D., 1413, 20th Street, N.W., Washington.

O. M. Walker, James B., 1617, Green Street, Philadelphia.
1897. Whitcomb, H. H., Norristown, Pa.
1898. Whitney, Herbert B., 320, Temple Court, Denver, Col.
1904. Wilder, John Archibald, Stedman Building, Denver, Col.
1898. Williams, Francis H., 505, Beacon Street, Boston.
1885. Williams, H. F., 197, Gates Avenue, Brooklyn.
1898. Williams, Harold, 528, Beacon Street, Boston.
1910. Wilson, Gordon, 806, Cathedral Street, Baltimore.
O. M. Wilson, James C., 1509, Walnut Street, Philadelphia.
1901. Wyman, Walter, Surgeon-General, U.S. Public Health and Marine Hospital Service, Washington, D.C.

O. M., Original Member.
Total, 145 active members

MINUTES.

THE Twenty-seventh Annual Meeting of the Association was called to order by the President, Dr. Edward R. Baldwin, of Saranac Lake, New York, at the New Willard Hotel, Washington, D.C., May 3, 1910, at 10 a.m.

The following members were present during the meeting:

Dr. C. D. Alton,
Dr. J. M. Anders,
Dr. E. R. Baldwin,
Dr. H. L. Barnes,
Dr. A. D. Blackader,
Dr. W. S. Boardman,
Dr. V. Y. Bowditch,
Dr. H. M. Bracken,
Dr. J. W. Brannan,
Dr. Sanger Brown,
Dr. C. C. Browning,
Dr. George E. Bushnell,
Dr. W. E. Casselberry,
Dr. J. A. Claytor,
Dr. T. D. Coleman,
Dr. R. G. Curtin,
Dr. Judson Daland,
Dr. T. Darlington,
Dr. W. E. Darnall,
Dr. N. S. Davis,
Dr. W. L. Dunn,
Dr. J. H. Elliott,
Dr. H. L. Elsner,
Dr. W. E. Ford,
Dr. C. F. Gardiner,
Dr. A. C. Getchell,
Dr. W. A. Griffin,
Dr. J. N. Hall,
Dr. I. H. Hance.
Dr. J. A. Hart,
Dr. T. W. Harvey,
Dr. J. L. Heffron,
Dr. G. Hinsdale,
Dr. E. F. Ingals,
Dr. A. Jacobi,
Dr. W. A. Jayne,
Dr. C. G. Jennings,
Dr. H. M. King,
Dr. H. M. Kinghorn,
Dr. E. Lefevre,
Dr. J. H. Lowman,
Dr. D. R. Lyman,
Dr. J. H. McBride,
Dr. G. H. Makuen,
Dr. Philip Marvel,
Dr. J. A. Miller,
Dr. C. L. Minor,
Dr. J. D. Morgan,
Dr. J. H. Musser,
Dr. J. B. Nichols.
Dr. E. O. Otis,
Dr. A. C. Peale,
Dr. Jay Perkins,
Dr. W. F. R. Phillips,
Dr. W. B. Platt,
Dr. J. H. Pratt,
Dr. C. C. Ransom,
Dr. C. W. Richardson,

Dr. W. D. Robinson,
Dr. J. O. Roe.
Dr. E. J. A. Rogers,
Dr. Henry Sewall,
Dr. A. A. Smith,
Dr. Fremont-Smith,
Dr. M. L. Stevens,
Dr. A. K. Stone,
Dr. W. H. Swan,
Dr. J. Gurney Taylor,
Dr. J. M. Taylor,
Dr. J. H. Tyndale,
Dr. E. L. Trudeau,
Dr. J. B. Walker,
Dr. H. H. Whitcomb,
Dr. J. C. Wilson,
Dr. Walter Wyman.

There were present as guests Professor Willis H. Moore, the Chief of the U.S. Weather Bureau, Dr. J. C. Foltz, of Philadelphia, and Dr. Emery Marvel, of Atlantic City.

Secretary and Treasurer's Report.

This Association has completed twenty-six years of its existence. During the past year there have been the following changes in membership: Dr. Rives, Dr. Risley, and Dr. Stengel have resigned. We have lost three by death. On April 8, Dr. Andrew H. Smith, President of the Association in 1894; on February 15, Dr. Charles F. McGahan, Vice-President of the Association in 1898; and on April 1, Dr. John P. C. Foster, of New Haven, who was elected only one year ago, and had not had the opportunity of attending a meeting.

Memorials of these members have been prepared by Dr. Beverley Robinson, Dr. T. D. Coleman, Dr. J. Dudley Morgan, and Dr. David Russell Lyman (see pp. xxi-xxvi).

Financial Statement.

Balance in hand, June 2, 1909		$247.09
Received from annual dues		864.50
,, ,, other sources		29.11
Expenses; for printing	$657.07	
Other expenses	259.46	
May 1, 1910. Balance in hand	224.17	
	$1140.70	$1140.70

The twenty-fifth volume of Transactions has been printed and distributed. This has been sent to members of all grades, and to the principal libraries and medical journals in America and Europe. For ten years we have had a favourable arrangement with the *Journal of Balneology and Climatology* in the publication of our Transactions, by which very many

of our papers have been republished and circulated in England and throughout the world. During the past year, however, the British Balneological and Climatological Society has become a Section of the Royal Society of Medicine, and the Journal will cease to appear inasmuch as the Transactions of the Royal Society will include the papers read in all the sections. During a recent visit to London the Secretary conferred with our publishers, and we believe that a favourable arrangement may be continued for publication abroad. Both the President and Secretary of the Balneological and Climatological Society, Dr. Leonard Williams and Dr. Septimus Sunderland, are corresponding members of our Association, and as your representative we are most delightfully and courteously entertained. We trust that in the years to come this fraternal bond will be strengthened, and that we shall see more of each other.

Excuses have been sent by Dr. A. J. Richer, Dr. W. G. Schauffler, Dr. C. E. Quimby, Dr. H. L. Taylor, Dr. Beverley Robinson, Dr. R. H. Babcock, Dr. S. A. Fisk, Dr. Wm. M. Gibson, Dr. J. B. Walker, Dr. W. H. Bergtold, C. E. Edson, and E. A. Locke for non-attendance at the Annual Meeting.

The following journals are received in exchange: *Bulletins of the Royal Academy of Medicine; of the Royal Academy of Rome; of the Royal Academy of Sciences*, Madrid; *of the Royal Academy of Medicine*, Belgium; *Tuberculosis*, London; *Tuberculosis*, Berlin.

Therapeutic Gazette; Interstate Medical Journal; Monthly Cyclopædia of Practical Medicine; Pennsylvania Medical Journal; Southern California Practitioner; St. Louis Medical Review.

The President appointed as Auditing Committee: Dr. J. E. Elliott and Dr. T. W. Harvey; as Nominating Committee: Dr. Thomas Darlington, Dr. E. O. Otis, Dr. C. F. Gardiner, and Dr. W. F. R. Phillips.

The Secretary read the report of the Council on the recommendations for membership as follows:—

For Election to Honorary Membership.

Dr. Beverley Robinson, New York.

For Election to Corresponding Membership.

Dr. E. L. Gros, 23, Ave. Bois du Boulogne, Paris.

For Election to Active Membership.

Dr. Paul M. Carrington, San Diego, California, U.S.M.H. and P.H. Service.

Dr. Bayard T. Crane, Rutland, Mass.

Dr. George D. Kahlo, French Lick, Indiana.

Dr. Alexander Marcy, Riverton, N.J.

Dr. H. R. M. Landis, 11, South 21st Street, Philadelphia.

Dr. Gordon Wilson, 806, Cathedral Street, Baltimore.

Dr. Cleveland Floyd, 1398, Beacon Street (Brookline), Boston.

Dr. B. R. Shurly, 32, Adams Ave., W. Detroit.

Dr. Samuel G. Dixon, Commissioner of Health, Harrisburg, Pa.

Dr. John M. Swan, Glen Springs, N.Y.

Dr. John D. Thomas, 1413, 20th Street, Washington, D.C.

Business Meeting, May 4, 1910, 12 noon.

The Association considered the resolutions offered at the last Annual Meeting to change the constitution. These related to the methods of proposal and election of members, notice having been given to all members in the announcement for the meeting and in the last volume of the Transactions (see pp. xviii. and xix.). The resolutions were reported as having been approved by the Council, and were discussed by Drs. Curtin, Lefevre, Jayne, Phillips, Minor, Bracken, and Coleman. By vote of the Association, Article III., Sections 2 and 4, were then altered to read as follows:—

Section 2.—"Names of candidates for active membership whose applications, submitted in writing, shall have been endorsed by three (3) active members shall be sent to the Secretary at or before the Annual Meeting at the second business session of which they shall be read, and then lie over until the next annual meeting, when such as are approved by the Council shall be balloted on. Three (3) black balls shall be sufficient to reject a candidate. The Council shall have power to nominate active members."

Section 4.—"Any member of the Association absent from the meetings, in person or by contributed paper, for three (3) consecutive years, without sufficient cause, shall be dropped from the list of members by vote of the Council."

News was received that Dr. Howard T. Ricketts, while

engaged in an investigation of an outbreak of Mexican typhus fever, had died of the disease in the City of Mexico. Dr. Ricketts was recently called from the University of Chicago to the Chair of Pathology in the University of Pennsylvania. His death while engaged in investigations for the benefit of mankind called for some appropriate action on the part of the Congress expressive of his service and heroism.

The President of the Congress, Dr. E. L. Trudeau, asked as many members as possible from each Association to meet at 2 p.m., in order to take appropriate action on Dr. Ricketts' death.

The President of the Association appointed, as representatives of the Climatological Association, Dr. John H. Musser and Dr. E. F. Ingals.

The following were proposed for election to active membership at the next Annual Meeting: Dr. Walter R. Steiner, of Hartford; Dr. Frank T. Fulton, of Providence; Dr. W. Charles White, of Pittsburg; and Dr. Linsly Williams, of New York City.

On motion of Dr. James B. Walker it was moved and seconded that we pass a resolution supporting the Bill introduced into Congress by Senator Owen to provide for a Department of Health.

An amendment was offered by Dr. A. K. Stone that Dr. Darlington be selected to represent us at the hearing, and that each member endeavour to influence his representative or senator in favour of the Bill. Carried.

The following resolution was offered to be considered at the next Annual Meeting:—

"We hereby propose that in Article III., Section 1, the last word be changed so as to read: 'This Association shall consist of active corresponding and honorary members, the latter not to exceed twenty.'"

GUY HINSDALE.
E. R. BALDWIN.

A communication was read from the Medical Society of the State of New York inviting the members of the Association to attend a reception on the evening of May 6, at the Academy of Medicine in New York City, in honour of one of our members, Dr. Abraham Jacobi, on the eightieth anniversary of his birthday.

Business Meeting, May 5, 1910, 10 A.M.

Dr. Baldwin moved a vote of thanks to Mr. Hight, the Manager of the New Willard Hotel, for courtesies extended to the Association during the meeting. Carried.

A vote of thanks was then passed to the Secretary, Dr. Hinsdale, for services in connection with the duties of that office.

A vote of thanks was given to Dr. Phillips, Chairman of the Committee of Arrangements, for his work in arranging the place of meeting and the Annual Dinner.

The Society then appointed Dr. A. D. Blackader, of Montreal, Chairman of the Committee of Arrangements for the next Annual Meeting.

The Scientific Session was then opened, and a paper was read by Dr. N. S. Davis, and discussed by Drs. Otis, Elliott, Bracken, Browning, Hinsdale, Minor, and Davis.

A paper was read by Dr. Hinsdale, and discussed by Professor Willis E. Moore, Dr. Phillips, Dr. Brannan, and Dr. Minor.

The incoming President, Dr. Brannan, was inducted to the Chair. After thanking the Society for his election, the Association adjourned.

Guy Hinsdale, *Secretary.*

DR. ANDREW H. SMITH.

PRESIDENT, 1893.

Died April 8, 1910.

IN MEMORIAM.

DR. ANDREW H. SMITH.

To those members of the Climatological Association who knew Dr. Andrew H. Smith well, words of praise and high appreciation were almost needless. But even to them it may be well to say a word of hope and cheer ; to the younger and aspiring ones a timely word to show a brave and loyal soul to imitate and follow were also well. My dear old friend Andrew was good, kind, conscientious, full of real religious zeal in well-doing, and that was the sort of fear of God that animated him. He worked hard and uprightly, and relieved many a bed of sickness or of death of its sharp suffering and dread. In my two only severe illnesses in New York, Andrew was near me and most serviceable. He helped save my life in diphtheria; he relieved me magically, almost, by his clear insight into medicine, when I was worn out with the pain and distress of acutely inflamed tonsils, due doubtless to scarlatinal infection, not otherwise evident. Whenever Andrew spoke or wrote on medical or other subjects, his words were words of wisdom. He always battled most bravely and singly for consciences' sake, and to those who listened and trusted he guided to better doing and higher living. Nor did the serious side of his nature prevent his sharing mirth and jollity, and many a good story he told and enjoyed. But he had no use for ribaldry, profanity, or things or thoughts of bad alloy.

To medical literature his contributions were many, and of very high excellence. His acumen was keen, and he was ever most suggestive. At once he was practical, and also, in a sense, idealistic, and by the latter word I mean there was always an undercurrent of well-thought-out judgments, which might seem theoretical to some, but were based upon wide knowledge of much that had been acquired by master minds in different directions.

Andrew's war record is bright and fair as that of many, thank God, of the bravest and best, who did yeoman's service

in our civil war as surgeons at the front. His life struggle in the beginning was hard and difficult, for he knew that it was meant to be so to those who strive manfully for the right. In his later years he was prosperous, but, alas, he was shadowed for a time with grave symptoms of disease.

His final few weeks of life were weeks of great suffering, despite all that devoted skill and affection could do for him. It was my enviable lot to see him several times before he died, and when I say enviable, it is not because I did not suffer keenly from witnessing distress which I could not relieve, but because one likes to do one's best to be useful to the good and the true of the world. The Climatological Association has lost a member and associate, who, with his unsullied record, shines brightly as an example to us all.

New York, BEVERLEY ROBINSON.
April, 1910.

DR. CHAS. F. McGAHAN.

DR. CHAS. F. MCGAHAN died in Aiken after a brief illness from pneumonia, on February 15, of the present year. He was born in Charleston, S.C., on July 25, 1861, and in this city his early days were spent. He attended the large private school of Professor Sachlaven, which prepared him for entrance to Georgetown University, from which institution he was graduated in 1881. After his graduation he went into the employ of the large mercantile house of McGahan, Bates, and Co., of Charleston, S.C., which gave him an excellent business training. Realizing that his best talents lay in the direction of a life quite foreign to the mercantile, he determined to devote his energies to the study and treatment of disease. He first studied under his distinguished kinsman, Dr. W. H. Geddings, a man of wide learning, and one who gave Aiken, S.C., its first impetus and reputation as a health resort. Following his studies with Dr. Geddings, he entered the medical department of Dartmouth College, and enjoyed the distinction of being chosen valedictorian of his class, on his graduation. After this he spent several years abroad studying in the clinics of London, Paris, and Vienna. On his return to America he spent a few seasons in Aiken in order to restore his health. Chattanooga seeming to offer greater opportunities, he now selected this for the field of his work. Here he quickly gained

CHARLES F. McGAHAN, M.D.

Vice-President, 1898. Died, February 15, 1910.

recognition, enjoying a large practice, and being elected Professor of Anatomy in the Chattanooga Medical College. His health failed him in his new field, however, and he was compelled to return to Aiken. In Aiken his talents were soon recognized, and his success immediately assured. He practised his profession in Aiken in the winter, and Bethlehem, N.H., in the summer, spending the interval between seasons in relaxation, travel, and study. The life naturally broadened and developed him, so that he was regarded by all as an authority on pulmonary disease and an able internist.

Many honours were conferred on him during his life in recognition of his great work. Among others he had the following conferred on him: Director of the National Association for the Study and Prevention of Tuberculosis; Vice-President of Section 2 of the International Congress of Tuberculosis; Emeritus Professor of Anatomy in the Chattanooga Medical College; Medical Director of the Aiken Cottage Sanatorium; member of the Laryngological, Rhinological, and Otological Association; member of the Climatological Association and the American Medical Association. Besides these he was a member of the Mississippi Valley, New Hampshire, South Carolina, and Aiken County Medical Associations. He took a great deal of interest in the affairs of Aiken County and this Section, being a Director at different times of the Bank of Aiken, Bank of Western Carolina, Bank of Barnwell, and the Bank of Blackville. He was a prominent club man, being a member of the University Club of New York City, the Aiken Club, and the Palmetto Golf Club.

Practising both in the North and the South, he was especially in demand among the inter-colonists in Aiken, numbering among his patients and friends many people of world-wide celebrity.

Concerning him personally, he was a man of unusual magnetism, combining as he did (a faculty which all physicians need and crave) a faculty which made his patients not only respect him as a doctor and man but love him as a friend and brother. I very greatly appreciate the privilege which I enjoy to-day in reciting this unvarnished sketch of his life. He and I were elected to membership in this Association of brothers in the same year, and for many years we have been friends and neighbours. You all knew him and loved him, and I know that without exception you join me in expressing our deep sense of loss in his early and untimely taking off.

THOMAS D. COLEMAN.

A truer, dearer, and more constant friend never lived than Charles F. McGahan. Our acquaintance and friendship began in 1877, when we were boys together at Georgetown College, and time only served to unite us closer. At College he was the most popular student, his unselfishness, geniality, and good fellowship making him an attractive comrade.

He graduated B.S. from Georgetown University in 1881, and four years later M.D. from Dartmouth. He went to Europe for some time, and I saw much of him at Trelat's clinic at La Charité, Pean's at Saint Louis, and at Fauvel's private clinic.

In after-life his friends and admirers were legion; many of his former patients were moved to tears in speaking of his death. His pet hobby was that he would retire from active practice at 50, and later take up farming as a gentleman's pastime, and he often talked of a farm near Washington or Baltimore.

The last time I saw him was in November, 1909, when he stopped over in Washington on his way from the North to Aiken. Even at that time, although apparently robust, his breathing was laboured, and on much exertion he would become markedly cyanotic. His appearance troubled me so much that I exacted a promise that he would telegraph me when he reached Aiken.

You have been told of his rapid rise in his profession, and of the places of honour and of trust which he held; but the chords of my heart are tuned to memories of schooldays and classroom, for to those days I often turn with melancholy pleasure, knowing full well that the contemplation will bring grief for the days that are no more.

> "Those friends thou hast, and their adoption tried,
> Grapple them to thy soul with hoops of steel."

JAMES DUDLEY MORGAN.

DR. JOHN P. C. FOSTER.

OUR President has kindly granted me the privilege of presenting to our Society the brief memorial appreciation of the late Dr. John Pierpont Coddington Foster, who died of pneumonia at his home in New Haven, Conn., on April 1, 1910, at the age of 63.

His election to this Society at our last meeting in recognition of his sterling work in tuberculosis was a source of deep

DR. JOHN PIERPONT CODDINGTON FOSTER.
Born 1847. Died April 1, 1910.

pleasure and gratification to him, and I had hoped at this and many subsequent meetings to further extend that close personal relationship in my work under and with him, which made me count myself as peculiarly fortunate among the younger men of our profession.

Dr. Foster was born in New Haven, Connecticut, on March 2, 1847. He prepared for college at Russell's Collegiate Institute in New Haven. He graduated from Yale Medical School in 1875, and settled in New Haven, where his family had borne a prominent part in the town's history since its foundation. In 1878 he was appointed Instructor in Anatomy in the Yale Art School, which position he held up to his death. He was for many years Port Surgeon of the United States Marine Hospital Service and Consulting Physician to the Yale Infirmary. Deeply enthusiastic, untiring, and unselfish in his devotion to his profession, he has left behind him a lasting impression of his life work such as is equalled by few men.

He was best known to the general public through his work in tuberculosis, in recognition of which Yale conferred upon him the honorary degree of M.A. in June, 1909. He knew from personal experience what it meant to fight through life handicapped by the disease, and combined a deep insight into the mental unrest of those first facing the fight against it with an ever-ready sympathy for them and a thorough knowledge of their needs. He spared himself nothing if he could lighten the burden of a tuberculous patient. This unselfishness which characterized his private practice he carried into his public work, and to his untiring devotion Connecticut is indebted to-day for four of its existing sanatoria.

To Dr. Foster belongs the distinction of having been the first physician in America to apply Koch's tuberculin for therapeutic purposes.

He was on the original Board of Directors of the National Society for the Study and Prevention of Tuberculosis, and was Vice-President of the Society in 1908. He was one of the incorporators of the New Haven County Anti-Tuberculosis Association, and as Chairman of its Executive Committee was more than any one man personally responsible for the character and success of the Gaylord Farm Sanatorium. When Governor Woodruff appointed a commission to study the tuberculosis problem in Connecticut he chose Dr. Foster as its chairman, and his report to the Governor is one of the most exhaustive and practical of the many that have been submitted by like commissions. Recognizing the fact that

the greatest need in the work was a proper provision for the care of the advanced cases, he insisted that the State's duty was primarily to these, leaving the sanatoria for curable cases to the care of private philanthropy. When his report was brought before the Legislature it was largely through his energy that a Bill was passed carrying two all-important provisions—the compulsory notification of tuberculosis and the establishment of country homes under the control of the State Commission where all classes of cases could be received. He was appointed Chairman of the Permanent Commission and given an appropriation of 175,000 dollars to open three such institutions of one hundred beds each. Few believed that the appropriation could be made to accomplish so much. These institutions will be opened within a few months, will accommodate 330 patients, and will be completed within the original appropriation; but the accomplishment cost the State dear, as the great labour entailed was largely responsible for Dr. Foster's death. He had hoped to hold out until their completion before taking a sorely-needed rest. While on a business trip to one of them he contracted pneumonia, and died six days later. Realizing that his end was near, he concentrated his energies for these six days in planning the completion of his work with the least possible disorganization from his death.

He was best known in Yale through his work among the students, and many a young man has had cause to be thankful for having come under his influence. As Professor Phelps said in introducing him for his degree: "But perhaps greater than all his honours is the daily quiet work that Dr. Foster has done for many years among the undergraduates of Yale. Trusted by the faculty and students, he has been of material assistance to both, and many a man to-day owes his health and character largely to the kindly counsel he received at the critical period of adolescence."

By those of us privileged to be counted among his friends, he was, as President Hadley says, "if possible, loved even more than he was respected," and has left to us an inspiring memory of one who lived and died "a gentleman unafraid."

DAVID R. LYMAN.

CONSTITUTION AND BYE-LAWS.

CONSTITUTION.

Article I.—Name.

This Society shall be known as the American Climatological Association.

Article II.—Object.

The object of this Association shall be the study of *Climatology and Hydrology and of Diseases of the Respiratory and Circulatory Organs.*

Article III.—Membership.

Section 1.—This Association shall consist of *active*, *corresponding*, and *honorary* members, the latter not to exceed ten.

Section 2.—Names of candidates for active membership, whose applications shall have been indorsed by *three* (3) active members, shall be sent to the Secretary at or before the annual meeting at the second business session of which they shall be read and then lie over until the next annual meeting, when such as are approved by the Council shall be balloted on. Three (3) black balls shall be sufficient to reject a candidate. The Council shall have power to nominate active members.

Section 3.—The power of nominating honorary and corresponding members shall be vested in the Council. The election shall be conducted in the same manner as that for active members. Honorary members shall enjoy all the privileges, but shall not be allowed to hold any office or cast any vote.

Section 4.—Any member of the Association absent from the meetings, in person or by contributed paper, for three (3) consecutive years, without sufficient cause, shall be dropped from the list of members by vote of the Council.

Article IV.—Officers.

Section 1.—The officers of this Association shall consist of a *President*, two *Vice-Presidents*, a *Secretary and Treasurer*, who, with five other members, shall constitute the *Council* of the Association.

Section 2.—*Nominations.* The officers, including the Council, shall be nominated by a committee of five (5) members, which committee shall be nominated by the President at the first session of each annual meeting and shall report at the business meeting.

Section 3.—*Elections.* The election of officers shall take place at the business meeting. A majority of votes cast shall constitute an election.

Section 4.—The President, Vice-Presidents, Secretary and Treasurer shall enter upon their duties at the close of the annual meeting at which they are elected, and shall hold office until the close of the next annual meeting, or until their successors are elected.

Section 5.—Members of the Council, other than the President. Vice-Presidents, Secretary and Treasurer, shall hold office for five (5) years.

Section 6.—*Vacancies.* Any vacancy occurring among the officers of the Association during the year may be filled by the Council.

Article V.—Duties of Officers.

President and Vice-Presidents.

The President and Vice-Presidents shall discharge the duties usually devolving upon such officers. The President shall be *ex-officio* Chairman of the Council.

Secretary and Treasurer.

As Secretary, he shall attend and keep a record of all the meetings of the Association and of the Council, of which latter he shall be *ex-officio* Clerk. At each annual meeting he shall announce the names of all who have ceased to be members since the last report. He shall superintend the publication of the Transactions, under the direction of the Council. He shall notify candidates of their election to membership. He shall send a preliminary notification of the annual meeting two (2) months previous thereto, and the programme for the annual meeting at least two (2) weeks previous to its assembly, to all the members of the Association. He shall also send notification of the meetings of the Council to the members thereof. At each annual meeting of the Association he shall read the minutes of the previous meeting and of all the meetings of the Council that have been held during the current year.

As Treasurer, he shall receive all moneys due, and pay all

debts therewith. He shall render an account thereof at the annual meeting, at which time an auditing committee shall be appointed to report.

Article VI.—Council.

The Council shall meet as often as the interests of the Association may require.

Four (4) members shall constitute a quorum.

It shall have the management of the affairs of the Association, subject to the action of the Association at its annual meetings.

It shall consider the claims of candidates recommended to it for admission to membership.

It shall not have the power to make the Association liable for any debts exceeding in total one hundred dollars ($100), in the course of any one year, unless specially authorised by a vote of the Association.

It shall have the entire control of the publications of the Association, with the power to reject such papers or discussions as it may deem best.

It shall have power to nominate active members at the annual meeting.

The Council shall have power to invite any gentleman, not a member, to read a paper at the annual meeting, on any subject within the scope of the objects of this Association.

The Council shall determine questions by vote, or—if demanded—by ballot, the President having a casting vote.

The Council shall constitute a Board of Trial for all offences against the Constitution and Bye-laws, or for unbecoming conduct, and shall have the sole power of moving the expulsion of any member.

The President, or any two members, may call a meeting, notice of which will be transmitted to every member two (2) weeks previous to the meeting.

Article VII.—Papers.

Section 1.—The titles of all papers to be read at any annual meeting shall be forwarded to the Secretary not later than one (1) month before the first day of the meeting, in order to appear on the printed programme.

Section 2.—No paper shall be read before the Association which has already been printed or been read before another body.

Article VIII.—Quorum.

A quorum for business purposes shall be ten (10) members.

Article IX.—Amendments.

This Constitution may be amended by a four-fifths ($\frac{4}{5}$) vote of all the members present at an annual meeting, provided that notice of the proposed amendment has been printed in the notification of the meeting at which the vote is to be taken.

BYE-LAWS.

(1) Meetings of the Association shall be held annually.

(2) The time and place of the meetings shall be determined by the Council.

(3) The dues of active members shall consist of an annual assessment not to exceed seven and a half ($7.50) dollars. Members in arrears shall not be entitled to vote. Those in arrears for two (2) years may be dropped from membership by recommendation of the Council.

(4) Order of business meeting.

First day:—

Calling the roll of members.
Minutes of previous meeting.
Secretary's and Treasurer's reports.
Appointment of auditing committee.
Appointment of nominating committee.
Report of Council on recommendations for membership.

Second day, Morning session:—

Reports of nominating committee and auditing committee.
Election of officers.
Election of members.

Announcement of candidates for election at next annual meeting.
Report of committee on health resorts.
Miscellaneous business.
Adjournment of business meeting.

PRESIDENT'S ADDRESS.

THE ORGANIZATION OF HEALTH RESORTS, WITH ESPECIAL REFERENCE TO TUBERCULOSIS.

EDWARD R. BALDWIN, M.D.

SARANAC LAKE, NEW YORK.

GENTLEMEN,—You have graciously honoured me with the duties and privileges of the Presidency of the American Climatological Association this year, and I shall do my utmost to show my appreciation of the position and of your courtesy. It is also with undisguised pleasure that I mention the fact that Dr. Trudeau, one of our honorary members, is President of the Congress this year.

As it has been customary in some years for the President of this Association to devote some portion of his address to the general subject of climate, and the scope of our deliberations relating to it, I have chosen a subject closely dependent upon, or growing out of, the most common cause for the existence of health stations. It is safe to say that at no time since the founding of the Association has there been so much need for the consideration of tuberculosis as related to the various resorts in this country. Certainly the enormous activity of national and local bodies directly engaged in the campaign of prevention has not usurped the interest of the Climatological Association in the problems connected with this disease. There is no body which is more representative of prominent medical men in health resorts, and largely identified with tuberculosis work. Fully one-half of our members have a direct interest in it, and are best qualified to lead in

local efforts to meet the problems which have arisen in these resorts.

We have not only many members identified with sanatoria, but also others whose experience with, and observation of, tuberculous patients outside of institutions eminently qualifies them for the proper understanding of the present-day difficulties.

Most of us have noted the rapid changes in the popular attitude toward tuberculous patients. Education of the public has brought as a logical consequence the fear of advanced invalids and of health seekers in general. Anyone can see the plain truth as to the future, and the probable effect upon health resorts. Either these places will attempt to exclude persons who are unable to conceal their condition, or, other means of support for the particular resort failing, there must be special provision made for such patients. Naturally, the well-to-do classes will be welcome, or may continue to select their climatic resort regardless of local prejudice; but instances are not unknown where the power of money has failed to cope with the power of fear or community interest. At the best such patients lead an unhappy existence surrounded by unsympathetic or, in some instances, actually hostile neighbours.

Now this situation is only one phase of the modern tuberculosis crusade, as reflected in some western and southern resorts. The erection of sanatoria does not and cannot fully solve the difficulty for the people of modest means. It must be remembered that few patients remain many months in an institution, even be it granted that it might be advantageous for them to remain longer. In both public and private sanatoria the institutional life palls on them in time. Moreover, the interests of the institution, as well as that of other patients, require their discharge if they become stationary or deteriorate in health.

On the other hand, it must be recognized that the benefit derived by the larger number now treated in sanatoria falls short of a cure, and thus they only serve to swell the ranks of partially cured or arrested cases. This is no argument against the value of sanatoria in the cure and arrest of the disease, among other good results obtained in such institutions. But signs are not wanting that many of these partially arrested sanatorium patients are seeking other climates and occupations in health resorts. Many are being advised to try other places considered salubrious, because their condition has become stationary and further improvement is hoped for by a change. As an evidence of this practice, I may cite the annual report of one State institution which records the fact that during five years seventy-one patients had left to continue treatment in other climates, two-thirds of whom were advised to do so by the medical officers. It is only natural that this should be the tendency, as it always has been when one place was thought not to "agree" with a patient.

But a more serious matter is the advice to change residence and occupation, generally to obtain some light work in the west and south-west. This is done with the best of intentions by physicians who no longer, as formerly, would think of advising an actively progressing or unfavourable tuberculous patient to do such a thing. The problem in these health stations is now slightly different, though only in degree. The patients under home or sanatorium treatment become arrested or fairly quiescent cases, and the question of occupation must be decided. Believing, as we all do, in the favourable influence of an invigorating climate, it is legitimate advice to encourage these people to leave home when all the circumstances are taken into account, and their resources furnish independent support. In such cases the course of sanatorium treatment at home has had only a beneficial influence upon the future habits and manner of life of those individuals.

If they relapse they command the ability to relinquish work and to secure proper care. I repeat that the emigration of such patients will probably continue, at least to places favourable for residence and business opportunities.

The number of people who are outwardly well after sanatorium treatment is certainly large, and many are travelling to and from health resorts. Often they cannot resume their former occupations because of their arduous character, or the changed attitude of the public and their associates toward the disease. This is especially true of those engaged in professional work, such as that of teaching, or in clerical and office work generally. If such patients do return from a sanatorium to their homes they are very likely to be sent away to some distant resort if they relapse, or try to make their homes in the vicinity of the sanatorium where they first found improved health. It is also true that in the East there are many of the incipient cases treated at home or at nearby institutions because of the undoubtedly good results thus obtained. Now let us see what the logical result is, and will be, of these changes in the attitude of the public and in the management of tuberculous patients. Are there fewer patients leaving their homes for other climatic conditions? Apparently not, if one may judge from the reports of physicians in resorts. Are there more incipient cases looking for employment or entering business in these places? Possibly, but they must keep the fact to themselves if it is true, for physicians do not see them. While I do not doubt that an increased number of unproved tuberculous suspects or hypochondriacs will be found, yet on a visit to Denver a year ago, I was informed that, in the opinion of our best qualified men, fewer actually incipient cases were sent, or went, West. Even the sanatoria in these resorts find it difficult to obtain the most favourable or incipient cases, and probably will continue to do so, as might be expected from the trend of modern ideas about

the value of treatment at home. On the other hand, more arrested and chronic cases are undoubtedly seeking climatic resorts, and we may predict that many will find occupation in growing towns. If these patients had not made a degree of improvement at home which encouraged them to expect further gain under more favourable surroundings, is it not possible that many would not leave home? This is undoubtedly a matter that works both ways, but so much has been preached against far-advanced cases being sent away, and they receive such a cold welcome—or no welcome at all—that I believe a change is perceptible.

The net result of these changes, so far as they have to do with the future of health resorts, as I see it, is colonization of the tuberculous who are in a half-arrested condition—a continual supply of dependent, or half-dependent, persons who gradually relapse, and who, by a sufficiently long sojourn, have gained a legal residence in the particular resort. A large proportion who thus remain will be able to maintain themselves wholly or partially for some time when in good condition. Eventually they become so ill that help is required, and they will have lost the means of support sooner than formerly because of the modern fear of contagion. It is easy to depict the situation and superfluous to call it a prophecy; these conditions now exist, and always have existed. What I wish to lead up to in reviewing the present and future outlook for resorts is the fact that some new agency should be devised to deal with the deplorable plight of the consumptive, misguided and ill-advised as he always has been.

The National Association for the Study and Prevention of Tuberculosis has been a great help in this matter by encouraging the organization of local associations. The function of such societies has primarily been educational—a laudable object and necessary, as we know. Yet the special problems presented by resorts require special activities and machinery for their needs.

While in many cities the agitation, lectures, and exhibitions have largely benefited the poor patients who cannot leave home, the same efforts have tended to work more hardship for the self-supporting patients away from home. Fewer hotels and boarding houses are open to them ; general hospitals refuse them, and special tuberculosis hospitals have always been avoided by the very persons who most need care. The few institutions that are now available do not fill the need within a tenth part. The movement for State, county, and municipal hospitals is steadily advancing, but there is no satisfactory method of caring for the people who wander away from their home communities to take their chances for livelihood in mountain and desert regions. There are attempts made by fraternal orders and charitable organizations, working independently, to give aid here and there, but they are spasmodic and ineffective, besides lacking co-operation.

The solution of the difficulty to my mind would be to create a bureau of information in every health station throughout the country which should be especially devoted to the needs of tuberculous persons. These bureaus should be independent in management of any particular municipal or other charitable department of the local government, yet should co-operate with all such agencies, public and private. The secretary should be placed in touch with similar bureaus elsewhere, and might well be partly supported by anti-tuberculosis societies, or leagues of state or national scope. It should be his duty to seek out tuberculous patients who are destitute or neglected, as well as to answer applications for aid, and refer them to the proper local agency for care, when one exists. So far, his duties would resemble those of any charity organization secretary, but in resorts the conditions call especially for machinery by which the responsibility of the care of these cases shall be shared by their home

communities. In many cases the patient can, and should, be sent home. He seldom makes the move on his own initiative. He must even be sent home against the wish of his family or friends, and a firm hand must be shown to them. Only through some such means will these cases be promptly taken in hand. Since the colonization of the tuberculous is a tendency which is gathering force, there will, in my opinion, soon be a greater necessity for hospitals, both public and private, to care for incurables in health resorts. So far as charitable, or partly charitable, institutions are concerned, the burden of support should certainly be widely distributed, and only through organization can this be made possible.

A beginning should certainly be made in the larger resorts by some form of reception hospital for a short term of treatment. The standard for its maintenance should be higher than the average county or health board institutions to make it useful for the class of patients most likely to need it. These reception hospitals would form clearing-houses for the return of incurables to their homes or other institutions, or to sanatoria and gainful occupations.

I leave these thoughts for your contemplation, realizing the many difficulties to be met. It seems to me that our members should try to lead in introducing some means by which the organization of health stations should be made efficient toward the ends most needed.

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THE STATE OF MAINE AS A SUMMER HEALTH RESORT.

BY ALBERT C. GETCHELL, M.D.
WORCESTER, MASS.

MAINE has come to be a popular and populous summer resort. It attracts the pleasure seeker and the tired worker. Can the qualities which satisfy these demands also be utilized for the restoration of health? I invite your attention to a consideration of this question.

Maine is a large state. It extends from the latitude of Saratoga Springs, New York, to that somewhat north of Quebec. It embraces a vast region of mountain, forest, and lake, unexplored wilderness much of it even now; a large area of comparatively level, cultivated land, made up of fruitful farms and busy, prosperous towns, and a coast section, picturesque and varied as are few others in the world.

To examine these sections somewhat in detail: first, the lake-mountain area. If one should take a fifteen-minute walk from the Union station in Portland, to the Western Promenade on a clear day, he will get a view that will well repay the easy climb that brings him there, for before him is the Presidential range of the White Mountains, Washington, and the others, and rolling down almost to his feet, billow upon billow of mountain and hill, while to the north and east stretch away into the distance more mountains and hills. And so one sees, marked on the map, a succession of uplands and mountains, even to the north-eastern corner of the state. The general elevation of this area is high. The Rangeley Lakes near the

New Hampshire line are 1,500 ft., and Moosehead Lake is upwards of 1,000 ft., above the sea-level. Many mountains of moderate elevation rise above this level, and Katahdin, in the central part of northern Maine, rivals in height the White Mountains themselves, being 5,248 ft. high. Unlike the White Mountain region, while the general level is high, the mountains are not so thick, and hence the broad valleys hold water, making the region one of lakes, as is the Adirondack region. The whole area was once densely wooded, and although extensive lumbering operations have been carried on for a century or more, it is still so. It is a vast area. Said Samuel L. Boardman, in 1884: "The three states of Rhode Island, Connecticut, and Delaware, could be lost together in the forests of northern Maine, and still leave about each a margin of wilderness sufficiently large to make its exploration without a compass a work of desperate adventure."[1]

South of this strip, embracing the State as we know it from its cities and towns, is a comparatively low and level country. This also extends up the north-eastern border to the Canadian line, embracing the fertile county of Aroostook. The south-eastern corner of the State, Washington county, is mountainous, the mountains being much lower than those of the north, but rocky and wild, covered with forests and crowded with lakes.

The coast is Maine's most unique possession. From Kittery to Portland it is not unlike the Massachusett's coast, a succession of rocky headlands and sandy beaches. But from Portland to Eastport the land puts far out into the ocean, and the ocean makes far up into the land, as it were sunken mountains. "The gashed coast" it has been called. These spurs of the lands make deep bays, or, if detached from the main land, islands. In two places the islands form archipelagoes, Casco, and Penobscot Bays.

[1] Department of Agriculture, Special Report, No. 4. The Climate, Soil, Physical Resources, and Agricultural Capabilities of the State of Maine. p. 6.

Casco Bay is retired from the sea, but on it, a salt water lake, with the rise and fall of the tide, but except for the winds that sweep over it placid as an inland lake. Penobscot Bay—meaning by that the stretch of water and islands from Rockland to Mount Desert—has the beauty and variety of Casco Bay, but is grander in its wider sweep of water and its flanking mountains. From Rockland to Bar Harbour is somewhat over 40 miles. About midway between them and out at sea, forming the apex of a triangle, is Isle au Haut, the high island of Champlain, rising out of the sea 600 ft. From the top of this mountain—Mount Champlain—with your back to the Atlantic, out of your north-west horizon rise the Camden hills, and, north-east, Mount Desert, between sea and islands in endless panorama. As I measure the map with a ruler, the distance from Kittery to Eastport is about 220 miles, while a careful estimate of the tide-water shore makes this distance upwards of 3,000 miles.[1]

If one looks at the map of Maine, he is struck with the number of splashes and dots of blue, which mean lakes. But not all are represented on the map. They could not be unless the map were mammoth in size. I believe the total number represented on the best maps is 1,620, but this does not include the multitude of small ones and ponds that only county maps would show. Not only does every town have its pond, but every school district even, and as these are neither dead seas, nor do they disappear into the ground like the outlet of a Nevada lake, they mean rivers and streams; so that one cannot go far without meeting that most delightful of companions of a summer day—a smiling pond or a chattering brook.

If one were to ask me what is the chief charm of Maine in the summer time, I should say its water, for not only is there the pleasure in looking at a body of water, but water is

[1] "Climate and Soil," p. 5.

a temperer of your hot day. Out of the city streets one gets to the busy docks for a whiff of the sea, and in the dusty country the shady bank of a lake, pond, or stream, has its coolness and refreshment. And then your lake, if it is of any size, is an area of the earth's surface without dust or impurity, and your river, especially if it is rapid, is a perpetual fan.

To mention a tenth part of these lakes and rivers would take too much time. Take just a few: Sebago Lake, not far from Portland, the Rangeleys further north, then Moosehead and all his brothers, where the Penobscot River runs in and out of them, where Thoreau paddled and tramped and camped. To the north others with the Allagash River, the paradise of the canoist. Between Lewiston and Waterville is another chain, smaller but beautiful, now much frequented by summer people, and becoming well known. In our boyhood they were North Pond, East Pond, Long Pond, Belgrade Pond, &c. Now they are all lakes with sonorous Indian names, and they deserve them. Washington County, in the south-eastern part of the State, has many lakes also. Many of the lakes are so large that sailing on them is a pleasure. In their native state they were well stocked with fish, and now are even better under the administration of an efficient Fish and Game Commission and proper laws.

The soil, I should say, is largely a clayey loam. I can find no definite description of it in books. But I have been over many parts of the State by railroad, carriage, and on foot, and in widely separated parts I have noticed the same characteristics. The mountainous parts are rocky as mountains are, in the south-eastern part this formation running out into the sea, solid granite. The town of Stonington in Penobscot Bay, a considerable town, is built on rock, so that the water pipes in many places run on the surface of the ground, for to do otherwise would necessitate blasting trenches through the rock. Thoreau speaks of the dampness of the woods about the

northern lakes, as did a patient of mine who spent last summer there, from which one would infer that the soil is not porous. On the other hand, Boardman[1] speaking of the Aroostook says: "The soil is deep, consisting of 10 or 12 in. of vegetable matter, resting on loam or clay, and beneath this a porous subsoil." This may explain the value of this region for pulmonary diseases, of which I shall speak later. I have also the statement of a physician in Oxford County to the effect that the soil there is sandy.

The climate of Maine, as indicated by its geographical position, is of the northern type, and like that of the rest of New England is changeable, one kind of weather following another in frequent, and it may be rapid, succession. To quote the weather authorities in this matter: "The passage over or adjacent to New England of areas of low and high barometric pressure is productive of manifold and radical changes in the daily weather conditions that go to make up the climate of the several seasons. As these cyclones and anti-cyclones in their passage from west to east traverse the land areas of the interior country, the attending weather conditions are mainly of the continental variety. The low-pressure areas (cyclones) cause unsettled weather, light or heavy precipitation, moderate or marked temperature changes, and fresh winds to destructive gales, according to the intensity of the disturbance. The areas of high pressure (anti-cyclone), with accompanying fair or clear skies, drier atmosphere and lower temperature, are the producers and distributors of fine weather. The low and high-pressure areas pass over or near New England, alternating on an average of once in three or four days throughout the year.[2] The climate of Maine par-

[1] *Loc. cit.*, p. 37.

[2] United States Department of Agriculture. Weather Bureau. Summary of Climatological Data for the United States." Section 106, Maine.

takes of that of New England in this respect, the changes in winter being of greater intensity than those of summer. But there are certain geographical peculiarities of Maine which materially modify climate, and particularly the summer climate. By the Maine summer we may understand the period from June 1 until well into and even the whole of the month of September. Being so far north, the general average of temperature is evidently lower than that of more southern latitudes. But summer even here has its intensities. Thus the maximum temperature of eighteen stations reported by the Weather Bureau, scattered over the State, for the month of August, 1909, was over 90° F., with two exceptions, one of the high temperatures being 99°, and several 95°, 96°, and 97°. But a hot day, particularly on the coast and in the lake region of the north, is almost invariably followed by a cool night. Moreover, these periods of extreme heat are short, and even then the heat is tempered by the large extent of forest, lakes, rivers, and ocean.

Climatically considered, the State divides itself into three areas, the lake-forest-mountain area, the low-level intermediate open area, and the coast area. The first begins at the New Hampshire line at the Rangeley Lakes, and extends to the north and east, covering the entire northern part of the State excepting a strip in the north-eastern part in Aroostook County, where the level is about 500 ft. above the sea, and which is largely under cultivation. The rest is a forest crowded with lakes. A northern latitude, extensive forest, abundance of water, elevation above the level of the sea—all these contribute to a cool and invigorating summer climate. The middle area has no distinctive features, except the great amount of water surface in the shape of ponds and rivers, and a land area either covered with trees or in a state of cultivation. So that, while the heat of summer is felt more than in other localities, it is rarely oppressive, and if so only for a short time.

The climate of the seashore has certain peculiarities of its own. In the first place it has a northern latitude. Then the Arctic current sets along the coast, and this very materially affects the summer heat. Furthermore, the trend of the coast is such that the hot winds of summer, the south and southwest winds, come over the ocean, so that the hot days, or sometimes a succession of very hot days, that we may have on the Massachusetts coast are unknown there. Again, owing to the deep bays and inlets of nearly the entire length of the coast, one has an opportunity to select his ocean climate, from that of the outlying islands and headlands, where one is practically out at sea and the weather is cool, even cold, to the inland and sheltered nooks, where one gets the heat of the land with the diurnal, tempered, and refreshing sea breeze.

The coast of Maine has its summer fogs, which are very dense at times, particularly to the east of the Penobscot River. These fogs are most prevalent in May, and are less so as the summer goes on.

To get an idea of the amount of sunshine in a Maine summer, I have made an average of the observations of the twenty stations recorded in the year 1902, and for a comparison have taken as a standard the average of a similar number of stations in Colorado, the land of sunshine. I have selected the stations of the eastern slope of the Rocky Mountains, with which we are most familiar, including the cities Boulder, Denver, Colorado Springs, and Pueblo. I took the year 1902 because I happened to have the records of the two States for that year.

Days	June		July		August		September		Total	
	Maine	Colorado	Maine	Colorado	Maine	Colorado	Maine	Colorado	Maine	Colorado
Clear ...	10	14	14	17	14	16	14	20	52	67
Partly cloudy	9	9	8	11	8	10	5	6	30	36
Cloudy ...	10	7	9	3	8	5	11	4	38	19

I find that the people of Oxford County, a south-western county, in which there are several sanitaria, have a notion that they have more sunshiny days than there are in other parts of the State. They are probably correct in this belief. I have looked through the annual summaries of the Weather Bureau for the past ten years, and find that the figures say so.

Within the last twenty or thirty years, the summer visitor has taken possession of the Maine coast, at first pushing north from the older resorts of the north shore of Massachusetts. Then the people of interior Maine sought out the pleasant places of their own coast, so that certain spots became frequented resorts with commodious hotels and comfortable cottages. York Harbour, Kennebunkport, Old Orchard, Casco Bay, Boothbay Harbour, with its neighbouring Mouse and Squirrel Islands, Owl's Head, Camden and Castine, in Penobscot Bay, and Mount Desert Island, are the more important of them. Then the intervening places were occupied by hotels or cottages, camps in many instances, until the entire coast is now a summer playground, sought for the cool sea air, the exceptional opportunities for sailing and fishing, the gay fashionable life of the summer hotel, or the quiet summer outing with the native farmer or fisherman, for as the New Hampshire farmer gets a larger income from his summer boarder than from his farm, so the Maine coast dweller opens his home to the city visitor. Along with this development of the hotel and boarding-house the steamboat lines have developed their properties, so that one can with ease and even luxury reach the remotest corners of the coast. And one can select whatever accommodation his taste requires or his pocket-book permits. At the same time, the sportsman, either the fisherman or hunter for big game, penetrated the northern wilderness of lake and forest, and there too have sprung up the comfortable, even luxurious, hotel, or the simple but still comfortable camp. This camp is a species of itself. At first

the sportsman utilized the logging camp. Then he built a camp for himself, and later others, usually natives, in places remote from the towns, built rough houses, in which they take boarders. These are buildings rudely erected in the woods, comprising kitchen, living and bed-rooms, or there may be one central building containing kitchen and dining-room with small shack-like buildings clustered about, where each one or small groups may find comfortable housing, while getting meals at the central building. So that, in this far-away wilderness, one can find the accommodation of a comfortable hotel or a simple camp in the woods, or by the shore of a lake. Or, if he wishes to go away from all settled abode, guides there are who will take him into the wilderness, and he can each night pitch his camp under the trees, and cook his meal by the fire of his own making. Again, the railroad has penetrated these remote places, and one can get into the Pullman car at Washington, and be set down at the little station in the quiet wilderness.

My attention was first drawn to the therapeutic use of a summer in Maine by a tubercular patient some years ago. This patient was a woman with chronic pulmonary tuberculosis, who worked in a straw hat factory in a Massachusetts town. Her home was in Maine, near Belfast. The prospect of obtaining a cure was so small that I did not feel like sending her away from home, but advised her to go there for the summer, and make the best of the climate. This she did with decided benefit. Another was a case of advanced pulmonary and abdominal tuberculosis. Here I had no expectation of cure or any substantial relief. This patient's father had a cottage on the Maine coast midway between Boothbay and Rockland. Here she went in May, and remained until October, improving to an astonishing degree.

A friend, who has taken the cure at a sanatorium, who is intelligent and faithful, was among the mountains of New

Hampshire, where he had gone on his summer vacation, with the purpose of utilizing the climate there to improve his health. He did not do well, and went to Sebago Lake, Maine, where he had friends. He was much better there, and attributed his improvement to the pure clean air from over the lake, whereas in New Hampshire there was a good deal of dust, particularly from automobiles.

A few years ago I was asked to see a young lady who had had a hæmorrhage. It was clearly a case of incipient pulmonary tuberculosis. This was in the early spring; in the late spring, all active symptoms having subsided, with my advice she went to the Aroostook, where her father lived. Being fond of outdoor life, she literally took to the woods, living in them all summer. She returned in the fall well, and has remained so since. The brother of this patient, a physician, tells me that when he goes to his Aroostook home he is free from the catarrh that is a source of almost constant trouble to him in his home in Massachusetts.

I have seen others, whose home was in the Aroostook, employed indoors about Worcester, who were running down in health, and had more or less definite signs of tubercular infection. These cases, when sent to their homes for the summer, have done decidedly well there.

I am told that the Katahdin Ironworks, a town about 30 miles east of the southern end of Moosehead Lake, has a considerable reputation for the treatment of pulmonary troubles.

Last April I saw a young man aged 24, whose past history, the character of his acute illness, and his manner of recovery from it, together with the physical findings in his lungs, made it clear to my mind that he was tubercular. I advised a summer out of doors before he returned to work, and suggested the Adirondacks. But after canvassing the situation thoroughly he did not want to go there, and we finally agreed upon a

camp on the shores of Moosehead Lake, where he spent the entire summer, returning in the fall in good health.

Of hay fever one speaks with caution. But Maine has its claims for immune areas. I have recently had a letter from a physician who has a sanatorium in Oxford county near the Rangeley Lakes, in which he claims for his locality immunity from the disease. I know of one case, a Philadelphian, who, if she is forced to stay in that city during the hay fever, has to constantly remain in a dark room, and even then is a great sufferer. This lady has passed a summer in the Rangeley Lakes with comfort. The Isle of Shoals, I believe, has something of a reputation for the relief of hay fever sufferers.

One summer I met a lady on Isle au Haut, who had come there not for her hay fever, but to her surprise, although she suffered from it before coming, she was free from it while there. One can understand why this might be so since the Isle au Haut is far out to sea.

A friend, a physician, tells me that when he goes to Fremont on Mt. Desert Island his hay fever leaves him. During his student days he was clerk in a Bar Harbour hotel, and he says hay fever victims came there for the relief of their trouble and found it. Another friend goes every summer to Southwest Harbour, and while there has no trouble from his hay fever.

Let me not be misunderstood. I would not claim for the climate of Maine extraordinary qualities for the cure of respiratory disorders, and particularly pulmonary tuberculosis. I am not one of those who believe that tuberculosis can be cured equally well in any climate. I believe that pulmonary tuberculosis is a very serious disease, and its cure means the utilization of every curative agency to its fullest extent. I believe that climate is a very important curative agency, and in my opinion the climate of Colorado, New Mexico, and

Arizona is the best in the United States for this purpose. But for various reasons comparatively few of our patients can utilize these, or nearer but still good climates, and we have to make the best possible use of the home climate. The question often arises, Where can we here in New England advise a patient to go for his summer outing? It may be one with a tubercular history, but who has never definitely succumbed to tuberculosis, or it may be one who has been sick and recovered, and who needs to harbour his resources to keep well. For such, Northern Maine offers, in my opinion, an excellent summer climate—better, I think, than any other part of New England, except Vermont.

I have not spoken of other diseases because I have no direct experience with them. But as out-of-door life is such an important adjunct to the treatment of various forms of disease, particularly nervous troubles, it would seem that the summer climate of Maine could be utilized for that purpose, either in the remote woods or in the stimulating air of the coast, or in the country between.

The recreation, using the word in its etymological sense, which the business man with worn-out nerves gets in the depths of the Maine woods, is well known. I think it is Dr. J. Madison Taylor, himself a frequenter of the northern woods, who lays out a vacation there, increasing in length as age increases, to maintain a proper balance of health.

The coast, too, with its tonic sea air, is another builder-up of tired and worn-out bodies. It must, however, be remembered that the summer of the Maine coast is cool, cold even in places, and a certain type of delicate person, not to say an invalid, finds it difficult to keep sufficiently warm to be comfortable. There is little bathing there suitable to any but the most robust, and in outside places impossible even for them.

In the western and south-western part of Maine there are several institutions for the treatment of sick persons. Some

are in operation there only in the summer, going south with their patients during winter, while others are open the year round. The Maine Sanatorium for tubercular patients is located in Hebron, Oxford County. There are other private institutions for other diseases in the same county.

In this vicinity is the well-known Poland Spring House, open from June 1 to October 15, while an annex to the main house is open the year round. This large and successful enterprise is the outcome of sixty years' growth, starting from and dependent on the use of the waters of a spring there for medicinal purposes, it being a diuretic water. According to Boardman[1] there are other mineral springs in Maine.

Such is the State of Maine. Its wealth of mountain, forest, lake, stream, ocean, and pleasant summer climate will be utilized more and more for the health as well as for summer play, and it is well that it should be so.

DISCUSSION.

Dr. C. L. Minor (of Asheville, N.C.) : I have had a personal opportunity of noting the value of the Maine summer climate in pulmonary trouble. I have not tried the up-country spoken of but have tried the coast, and, despite the fogs, have found the latter admirable. There is not only a very cool summer, which is important, but there is a combination of the brace of mountain air with the tang of the sea air which has a wonderfully stimulating and appetizing effect, and I believe, in properly selected cases, with slight trouble and moderate symptoms, that the Maine coast in the summer is to be thoroughly recommended, and that you would have to go into Upper Canada to get as good.

Dr. E. O. Otis (of Boston, Mass.): In this connection it may be well to mention the adjacent coast of New Hampshire, 13 miles in extent, reaching from the Piscataqua River on the east to the Merrimac on the west. This short coast-line for the larger part is composed of sandy beaches, in contrast to the rocky character of the Maine shores. From personal experience of several years with the summer climate of both the Maine and the New Hampshire coasts, it has appeared to me that on the

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[1] *Loc. cit.*, p. 15.

latter coast there is a little drier atmosphere. In other respects, so far as the temperature and the climate are concerned, the conditions of the Southern Maine and New Hampshire coasts seem very similar.

Dr. GUY HINSDALE (of Hot Springs, Virginia): I would like to say a word about the climate of the coast of Maine. I have had some experience with it for the last twelve or thirteen years, and I read a paper before this Association on the "Climate of New England, with a Chapter on the Climate of Maine," 1901 (*Transactions*, vol. xvii., p. 71). The soil of the coast is more sandy than that of the interior, and the air of the coast is not so damp as most people think. I agree with Dr. Bowditch in his views regarding the dryness of fogs of Maine. It seems paradoxical to speak of dry fogs, and yet there is a certain amount of truth in it. We may have vapour in the atmosphere, and while that vapour is visible, still the atmosphere itself is not as damp as the fogs which we get in our cities on the top of the mountains. A fog on the top of a mountain may seem more penetrating than the fogs of the seashore, whether it is Maine or Massachusetts. The Maine climate is a changeable one. It is true generally that on nine days out of ten there is rain in some part of New England, and that it is subject to cloudy weather, owing to the frequent passage of cyclones down the valley of the St. Lawrence. But this comparison which Dr. Getchell made shows that we are not so very far beyond the State of Colorado as to the total number of cloudy and partly cloudy days. As far as game is concerned in Maine, it is surprising to me to find out how many deer are transported by the railroads. Over 3,000 deer every year have been for a number of years past transported by the railroads in Maine. These deer are only a part of the total number that are killed, and if we reckon the venison eaten in camp, probably there are about 4,000 or 5,000 deer killed in the State of Maine every year. About 175 moose are transported yearly by the railroads in Maine. So the game supply of Maine is on the increase rather than on the decrease. There are very stringent laws, too, regarding the shooting of deer and moose out of season; there is a one-thousand-dollar fine for killing moose out of season. There is a one-thousand-dollar fine for a gunner killing more than one moose in a season. So the State of Maine has done a great deal to preserve its natural resources; it does a great deal more than many other States in this direction. The income to citizens of the State of Maine from the visitors who come to it is considerably upwards of fifteen millions of dollars every year, and of course the State of Maine is wise enough to see the necessity of doing many things for the protection and the interest of the summer visitor. They are also improving the roads of Maine, I am glad to say, through State appropriations, which is a very valuable point.

Dr. V. Y. BOWDITCH (of Boston, Mass.): For the last twenty years it has been my custom to go down to the coast of Maine on one of the Cranberry Islands, near Mount Desert, and I can testify to the purity of the climate in August there. The south-west winds come over the cold

water with a quality which makes a tonic atmosphere that I know of nowhere else in the world. It is a peculiar fact that the fogs of Maine seem often to have a dry quality, paradoxical as that may seem. They hang over the islands, and to a certain extent inland, often through the summer, but the curious fact is that you will see clothes hanging out drying in the midst of them, and as you walk along you feel scarcely any moisture on your face or clothing. In this they are different from those which penetrate the southern coast of Massachusetts, Connecticut, and Rhode Island. One fact I noticed about twenty years ago, viz., the singular absence of cases of tuberculosis on these islands. I am sorry to say that during the last ten years, for some reason or other, cases have appeared, and I try to explain it to myself in this way—that the people have become more accustomed to going on the mainland to the cities and more crowded districts. The cases that I recall now are those who have left the Island and have been more or less on the mainland, where I imagine they must have become infected. It is a pitiable fact. All this has arisen in the last few years. They are fortunate in that they have a good physician there who is teaching the inhabitants how to keep the disease under control.

Dr. J. Clinton Foltz (of Philadelphia), (Guest): My summer house is at the eastern horn of Casco Bay, Maine, and the shoes and leather goods left in it over winter are not moulded as they would be elsewhere, showing how rapidly the evaporation occurs, and how little heavy moisture there really is. Immediately after the fog rises the dust in the road is very easily kicked up.

The increase of tuberculosis there recently I think is due to the inhabitants closing their houses and living around their stoves. They have not yet learned that they must not keep a tuberculosis patient warm. They pack fir branches around the houses and cover them over with snow to make them air-tight during the winter. So, when a family of farmers, as I have seen along the coast, once gets infected, before they are educated to get the air into the house, the whole family is infected and have been cut off one after another.

NORWAY FOR NEURASTHENIA.

BY CHARLES E. NAMMACK, M.D., LL.D.
NEW YORK CITY.

WHEN that much-quoted individual, "the overworked business man," makes a trip to Europe in search of rest and recreation, he usually looks for it in such busy marts of commerce and pleasure as London, Paris, Berlin, and Vienna. These have their vantage points for study of their industrial, social, æsthetic, sanitary and moral conditions, and usually leave the American with the pleasant satisfaction that our own large cities compare very favourably with them in similar respects. But for one who can spare three weeks from his itinerary for something more restful and inspiring, a visit to Norway can be heartily commended. The number of touring steamers now leaving the various parts of England, Scotland, Holland, and Germany make the necessary connections easily available, and the Norway trip is well worth while. A direct trip from New York to Christiania can also be made by comfortable steamships.

Norway consists of one huge mountain mass cut through in all directions by valleys, gorges and passes, intersected again by lakes and rivers forming torrents, cataracts and waterfalls innumerable, while the coast is indented by deep fjords which penetrate the land in many cases for a hundred miles and upwards. The coast is surrounded by a skjaergaard, a barrier of innumerable islands and rocks forming a natural breakwater between the sea and the mainland which, with but a

few short breaks, makes a perfectly smooth and navigable channel.

Norway lies between 57° 58' and 71′ 11′ north latitude, its length being about 1,200 miles, and naturally must present some varieties of climate. But these modifications are not due so much to difference in geographical position as to other operating causes, such as vicinity to the ocean, height above the level of the sea, peculiarly sheltered situations, and a variety of other causes. The western coast, particularly at its northern part, enjoys a mild climate owing to the fact that the Gulf Stream impinges upon it at about latitude 62°. Thus the mean temperature at the North Cape and at Christiania during the winter months is the same, although these places are separated from each other by 12° of latitude. But in the interior, out of the influence of the sea air, the cold in winter is intense and the heat in summer is equally oppressive. Thus at Valle, latitude 59°, altitude 1,000 ft., the thermometer in summer may stand at +42 C. (107° F.), and in winter falls to -35 C. (− 31° F.). But, on the whole, Norway enjoys the mildest climate of any region so remote from the Equator. Around the North Cape, in latitude 71° 11′ the sea never freezes except at the head of the fjords, although in the same latitude Sir John Franklin perished in North America. Owing to the continuous daylight in summer, vegetable growth goes on with incredible rapidity and the rose-embowered houses of Molde, 3° north of St. Petersburg, will remind one during July of our own lovely southern California homes. Wheat is cultivated as far north as 64° 30′, rye as far as 69°, and barley and oats occur up to 70°. The annual rainfall on the western coast is heavy, but diminishes from the coast inland. At Bergen, the first port of call for the tourist steamers, it exceeds 75 in. At the entrance of a fjord it may be 80 in., but at the head of the fjord may register but 16 in. The traveller must not be discouraged by an arrival in the wet at

Bergen, where it is sure to rain at some hour of almost every day. There is a beautiful country awaiting him far away towards the icy north, a land of magnificent mountains, wild ravines, picturesque lakes, superb glaciers, fjords reaching far inland into grand scenery, countless cascades and rapids, rivers and streams which plunge in splendid waterfalls from the heights into chasms. And in the northern part of this land, from May 30 to August 1, the sun shines day and night, the stars are never seen, and the moon looks pale and sheds no light upon the earth. Once landed in Norway we are in the land of romance, and the flaxen-haired, blue-eyed, simple, honest men we meet carry us back to the days of the Norsemen and of the Vikings. The absence of obsequious servility, so noticeable in those who serve us in other European countries, is peculiarly grateful to the freedom-loving American, and the sturdy sense of equality with which your stolkgaerre driver shakes your hand on parting compels your admiration and respect. Independence and frankness characterize all classes of society, and the absence of class lines has played a great part in the high place the Norwegian people hold in the culture-history of Europe. Björnson asserts "that no other country possesses so many men in official positions (and professions) who are peasant-born." The great national university at Christiania is attended by the sons and daughters of the humblest farmers. Norway has an excellent system of district physicians and midwives for attendance upon the sick poor. Vaccination is compulsory, and no child can be confirmed without producing a certificate of successful vaccination. The death-rate would be very low if the drowning incident to the shipping, lumber industries, and fisheries were excluded. Acute bronchial catarrhs are among the most frequent epidemic diseases, and tuberculosis occupies the prominent place among the chronic infections. Leprosy, under the policy of segregation, is markedly decreasing, but

is still so commonly seen as to excite no hysterical leprophobia. In spite of a steady stream of emigration to the United States, the population of Norway has doubled during the last fifty years, and wise parliamentary measures to improve the economic condition of the farmers and to diminish the occupation dangers of the factory labourers have done much to minimize the hardships of people living under unfavourable physiographic conditions. The people are industrious, phlegmatic, sober, religious, and contented, and a few weeks spent amongst them and in sight of their everlasting hills would be the best tonic for a restless, sceptical, neurotic invalid. Their absolute belief in the mercies of an all-wise Creator, their absolute confidence in one another, their respect for law and order, form a refreshing picture in these days of religious unbelief, social unrest, business dishonesty, and official corruption.

After the restful cruise amongst the fjords, another steamer may be taken at Trondhjem for the journey to the North Cape and for the wonderful sights of the midnight sun. Fog is apt to defeat the object of this trip at its terminal point, it being estimated that but one out of every four tourists finds the sun unobscured by fog; but no one admits disappointment, because sometime during the week occupied by this tour within the polar circle the phenomenon is sure to be observed and well repays the journey. The invaluable Herr Baedeker says that those who have the rare fortune to see the midnight sun in the Lyngenfjord before or after reaching North Cape witness a more beautiful scene than at North Cape. This Lyngen district will well repay a week's stop over, after the trip to the bleak and inhospitable North Cape; but the traveller who has noted the attractions of the wonderful, beautiful Hardanger Fjord on the way up will probably make his stop over there, if time permits, after his return to Bergen. Bergen has many features of historical and one of pathetic interest,

the leper hospital, where all varieties and stages of leprosy may be studied. Since the lepers have been isolated and denied the right of marriage (1856) there has been a decrease of nearly 70 per cent. in the number of cases.

From Bergen to Christiania, the beautiful Valders route, which is a combination of railway, steamer, and carriage travel, offers wonderful scenic and human interest, the journey being broken overnight at Vossevaugen, which, in any other country but Norway, would be considered a beautiful town. Arriving at Christiania, the modern capital, the student of social conditions will be interested in the public control of the liquor traffic, which has done so much to control intemperance, promote health, and diminish crime in Norway. This Göteborg system, introduced about forty years ago, is practically a system of local option administered by philanthropic companies, the profits of the business going to public utilities. Norway originally consumed more alcohol *per capita* than any country in Europe; to-day her annual consumption is less than that of any part of Europe, except Finland, where women's suffrage has practically legislated liquor traffic out of existence. Since adopting temperance the death-rate of Norway has fallen from 33 per 1,000 to 10·5. There is no restriction on the sale of beer, which in Norway contains $3\frac{1}{2}$ per cent. of alcohol. Christiania is a beautifully placed city and is fast becoming popular as a winter resort for those interested in such sports as ski-ing, sledging, skating, tobogganing, ice-pegging, and the like.

THE METEOROLOGIC AND HYGIENIC RELATIONS OF THE FLOODS IN FRANCE IN 1910.[1]

By GUY HINSDALE, A.M., M.D.
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THE flood of the River Seine in January, 1910, was so extraordinary, and produced such widespread distress and world-wide sympathy for the sufferers, that a record should be made of this event in our Transactions. The writer was in Paris throughout the flood and watched the river rise for ten days before it reached its maximum. During this period there were some rainy days, and the rainfall had been considerably above the average. In 1909 the rainfall recorded on Parc St. Maur Observatory was 26·5 in., and there was a great deal too much proportionately in the last three months of the year. The average annual rainfall at Paris is 22·56 in., or 574 mm. For January, 1910, the rainfall amounted to 74 mm. (2·95 in.) as compared with the normal average of 35 mm. (1·45 in.). The annual rainfall of Paris is thus about five-eighths that of New York or Philadelphia.

I have received through the kindness of M. Flammarion, the Astronomer and Secretary-General of the Astronomical Society of France, a record of the rainfall in France and the height of the Seine as recorded at the Pont de la Tournelle, from which I am able to furnish the following data (millimetres) :—

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Paris ...	41	16	62	22	38	99	70	48	51	106	21	80
Parc St. Maur	38	12	64	33	46	72	96	48	49	105	31	71
Juvisy ...	38	15	68	32	18	77	75	41	58	84	30	84

[1] The figures illustrating this article are reproduced from the "Bulletin de la Société Astronomique de France," by the courtesy of the Editor.

These figures are above the average but not excessive. The totals for the year are: Paris (Mont Souris), 654 mm. in place of 562 mm.; St. Maur, 666 mm. in place of 575; Juvisy, 620 mm. in place of 542 mm. It was the rainfall above Paris, in the region of the Upper Seine, of the Yonne and the Marne that caused the flood. These streams and their

FIG. 1.—Avenue Labourdonnais, Paris. (Photo by Mlle. Baudouin.)

tributaries played the important *rôle*. In these districts rain fell when Paris was wholly free from precipitation. During January, 1910, the rainfall at Paris was 74 mm., at St. Maur the normal being 40 mm.

The sudden increase in the flood on the 21st and 22nd is due to the simultaneous access of the waters of the Yonne, the Grand Morin and the Loing (Clamecy), from the rains noted on the 18th, 19th and 20th.

Day :	17	18	19	20	21	22	23	24	25	26	27	28	29
January, 1910	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Haute-Marne : Chaumont	7·3	25·7	40·4	8·9	3·8	0·1	3·0	22·9	9.3	0·2	1·3	0·5	5·6
Haute - Seine : Chatillon	8·5	29·2	36·0	9·0	...	...	16·0	5·0	6·0	4·4	...	6·0	...
Yonne: Clamecy	1·2	10·7	24·0	20·0	12·0	...	...	9·8	...	...	5·3	...	5·0
Yonne: Les Settons	17·7	61·0	59·9	27·3	...	3·1	23·5	20·7	8·0	6·3	...	10·4	6·0
Grand Morin : Coulommiers	3·9	13·4	19·8	11·4	...	...	...	20·2	15 3	...	0·2	...	7·2
Seine : Melun	12·4	10·1	6·4	...	...	0·1	6·8	10·0	..	...	4·3	...	3·5
The following is the height of the Seine at the Pont de la Tournelle in *metres*	2·35	2·60	2·78	3·80	4·62	5·77	6·08	6·57	6·92	7·34	7·98	8·50	8·35

We may note, in passing, that the snowfall in France was very light during January, and was scarcely sufficient to insure good winter sports in the French Alps.

The next thing to take into account is the fact that the temperature in France has been unusually mild this winter, and well above the freezing point through January. We were impressed with the fact that the grass remained green all through Paris, Versailles, and the environs in mid-winter. Conditions then were favourable to thawing and not to freezeing even in the higher portion of the valley of the Seine.

Paris is about 110 miles from the mouth of the river, which is navigable to the sea. The watershed of the Seine reaches a height of not over 700 to 800 metres (2,500 ft.), and covers about 80,000 square kilometres. Some of this watershed is permeable, but about a fourth of it is not permeable, and hence lends itself rather easily to quick and torrential drainage. In the permeable area the water is first completely absorbed by the soil, and then oozes out to collect at low-lying points and form watercourses, the floods of which rise gradually and, though not very high, are of long duration.

The Seine watershed is classified under both characters,

and it is shown that in times of continued rain, such as occurred in January, the torrential tributaries are the first to fill, and their floods reach the main stream before those of the slower tributaries. But as the rain continues the latter swell gradually and continuously, while meantime the torrential streams rise several times their natural size until their floods

FIG. 2.—Ledoyen Restaurant, Champs Elysees, Paris, January 27, 1910. (Photo by A. Tessier.)

add themselves to the waters of the slow streams now swollen to the greatest extent. Thus the geographical conditions of the Seine basin in continued rainy weather permit the coincidence of the successive floods of a certain number of tributaries, and sometimes, as has been the case this year, of most of them.

These coincidences, which depend on the simultaneous occurrence of prolonged rains throughout the basin, are

evidently somewhat uncommon. Such floods as we saw in 1910 we shall probably in the nature of things never see again; at least such a flood has not been witnessed since 1658.

We have, then, a rainfall slightly in excess of the normal; a mild winter and imperfect drainage of the Seine, and the result is a stupendous flood. We confess that, on superficial

FIG. 3.—Rue de Poitiers, Paris. View from the interior of the Gare d'Orsay, January 25, 1910. (Photo by L Rudaux.)

view, the apparent causes seem greatly out of proportion to the tremendous results, and we cannot see why such floods may not easily be repeated.

The Seine at Paris is formed by the union of the Yonne, the Marne, and the Upper Seine. The latter is a slow river; the Yonne is decidedly torrential; the Marne drains a basin

which is partly permeable and partly impermeable. But in times of freshet the whole area is well saturated, and the distinction between permeable and impermeable areas is very indefinite.

It has been calculated that a flood in the torrential streams reaches Paris in three or four days from the more distant parts

FIG. 4.—The Chambre des Députés and the rue de Bourgogne, January 27, 1910. (Photo by A. Tessier.)

of the basin,[1] while the corresponding flood of the lower streams is at least three or four days later.

These meteorological and geographical features must be reckoned with if Paris is to be spared another disaster.

M. Camille Flammarion, the French astronomer, has re-

[1] For a review of this subject see *Times*, London, February, 2, 1910.

called what the late Emperor of the French, Napoleon III., wrote in his essay on the extinction of pauperism : "The sun absorbs vapours to distribute them as rain over places which need water. When this restitution takes place regularly, fertility is the result ; but if the sky in its wrath sheds partially in storms and tempest the vapours which it has absorbed, the germs of production are destroyed and sterility is the result. The distribution makes all the difference. If it is equitable and regular, it creates abundance ; if it is prodigal and partial, it brings in a dearth" : in fact it is the irregular distribution of rain that brings on disaster.

Under Napoleon III. M. Belgrand, the engineer of the Water and Sewers Department of Paris, established a hydrometric service which enables one to foretell the state of the river twenty-four to forty-eight hours in advance.

In order to test the question as to the effect of forests in regulating the flow of water M. Belgrand had daily measurements made from November, 1850, to May, 1853, of the discharges of the Cousin and of the Grenetierre, which is one of its affluents. Both of these basins are of granite formation, impermeable and otherwise alike ; but the first is only about one-third wooded, while the second is entirely covered with trees. Notwithstanding this great difference as regards the extent of forests in each, the results have been the same in both, as is shown by the following account :—

"The regimen of each is identically the same, although their valleys are unequally wooded. Their waters rise and fall at the same rate, whether in rainy weather or in dry, in winter or in summer ; their low winter regimen is more abundant than that of summer.

"A heavy rain in winter produces in both a sudden flood of greater or less height, but of very short duration, followed by a long stage of tolerably high water ; the sudden and high freshets take place in each at the same time."

The different details concerning the flow of water are, then, exactly the same in the two basins, and yet one is entirely covered with forests, while in the other two-thirds is bare of trees. M. Belgrand has made a number of more detailed observations yet, which show, further, that it is not upon

FIG. 5.—A view of the Place Maubert, Paris, January 27, 1910. (Photo by L. Rudaux.)

forests but upon cultivated ground that the greatest regularity in flowage is observed.

How much deforestation has influenced the recent flood is not clear. As far as I have been able to learn, the watershed of the Seine has not undergone marked alterations by deforestation in recent years. The Seine basin is shallow, and there is no permanent snow; the steeper slopes are occupied by vines and pastures. There are some large areas of soil of

calcareous oolite which are well suited for the growth of pine trees. As a preventive measure afforestation affords some hope. On January 31 a resolution was adopted by the Council General of the Marne Department urging the Government to prevent further deforestation by imposing prohibitive taxes. Replantation has been successfully accomplished in the desolate tracts of Champagne-Ponilleuse, where large groves of pine are in vigorous growth.

Prof. Willis E. Moore, the chief of the United States Weather Bureau, has lately published a Report on the Influence of Forests on Climate and on Floods. In this report (Washington, Government Printing Office, 1910) he takes the ground :—

"(1) Any marked climatic changes that may have taken place are of wide extent and not local, are appreciable only when measured in geologic periods, and evidence is strong that the cutting away of the forests has had nothing to do with the creating or the augmenting of droughts in any part of the world.

"(2) Precipitation controls forestation, but forestation has little or no effect upon precipitation.

"(3) Any local modification of temperature and humidity caused by the presence or absence of forest covering, the buildings of villages and cities, &c., could not extend upward more than a few hundred feet, and in this stratum of air saturation rarely occurs, even during rainfall, whereas precipitation is the result of conditions that exist at such altitudes as not to be controlled or affected by the small thermal irregularities of the surface air.

"(4) During the period of accurate observations the amount of precipitation has not increased or decreased to an extent worthy of consideration.

"(5) Floods are caused by excessive precipitation, and the source of the precipitation over the central and eastern portions of the United States is the vapour borne by the warm southerly

FIG. 6.—A view of the Gare Saint-Lazare and the rue de l'Arcade, January 27, 1910. (Photo by L. Rudaux.)

winds from the Gulf of Mexico and the adjacent ocean into the interior of the country, but little from the Pacific Ocean crossing the Rocky Mountains.

FIG. 7.—Rue de l'Université. View from the Esplanade des Invalides, January 29, 1910. (Photo by Em. Touchet.)

"(6) Compared with the total area of a given watershed, that of the headwaters is usually small and, except locally in mountain streams, their run-off would not be sufficient to cause floods, even if deforestation allowed a greater and

quicker run-off. Granting, for the sake of argument, that deforestation might be responsible for general floods over a watershed, it would be necessary, in order to prevent them, to reforest the lower levels with their vastly greater areas—an

FIG. 8.—Inundation of the Esplanade des Invalides, January 29, 1910. (Photo by Em. Touchet.)

impossibility unless valuable agricultural lands are to be abandoned as food-producing areas.

"(7) The run-off of our rivers is not materially affected by any other factor than the precipitation.

"(8) The high waters are not higher, and the low waters

are not lower than formerly. In fact, there appears to be a tendency in late years toward a slightly better low-water flow in summer.

"(9) Floods are not of greater frequency and longer duration than formerly."

FIG. 9.—The Great Hall of the Gare du Quai d'Orsay. The rails of the Orleans Railway are under five metres of water. (From *L'Illustration.*)

It has been a very interesting thing to watch the effect of this flood on the occurrence of disease. It must be understood that the waters encroached on some 2,000 acres in Paris, along seven miles of the course of the Seine and many hundreds of square miles above and below the city. Aside

from the encroachment of the river, extensive areas filled with water from the sewers. There are hundreds of miles of sewers and two partly underground rivers, the Bievre and Grande Botel Betliere, in Paris. The sewers converge into large collecting sewers, which discharge into the Seine at Clichy below Paris. When the River Seine rises to an unusual level there is a back pressure into these sewers, and a difficult or sluggish exit of contents ; add to this the drainage from streets and houses, and it is not surprising that breaks occur, the contents flooding thousands of cellars, emerging in the streets, and, at their subsidence, leaving a nasty, foul-smelling deposit, implanting in thousands of homes the danger of disease. What diseases may we expect ? Time only will determine. The French have instituted very active and extensive methods of disinfection, and will certainly handle this matter on the best scientific lines.

We naturally first think of epidemic diseases like typhoid fever. We remember the great amount of typhoid that followed the flood at Johnstown, Pennsylvania, in May, 1889. It is a matter of record, also, that in Rome, in 589, a great pestilence followed the inundation of the Tiber.[1] Instances no doubt could be multiplied. Bacteriologists state that the vitality of the typhoid bacillus is comparatively small in the presence of the innumerable organisms always present in sewage and sewers. This would seem to minimize the danger from sewage deposits as far as typhoid fever is concerned. It would not, however, be safe to rely on such assurances. The vigorous sanitary measures adopted by the French include wholesale disinfection of all inundated premises by State authorities as well as by private organizations. The Société de Secours Aux Blessees Militaires, with its thirty-six branches

[1] On the Castle St. Angelo at Rome is a large figure of an angel sheathing a sword in commemoration of the staying of the pestilence. The latter was very fatal, but its exact nature is not known.

and 150 nurses, are doing everything possible to assist the stricken inhabitants to set their houses in order and begin life again under hygienic conditions.

Paris toward the end of winter is damp at the best, and the access of so much water into cellars will probably increase the amount of illness from influenza, tonsillitis, rheumatism, pneumonia, pleurisy, bronchitis, and possibly other diseases. It would be expected that some diseases like neuralgia, gout, and diarrhœa or dysentery may originate or be aggravated by the cold and wet surroundings in which many thousands of Parisians must live and work for months to come.

The latest reports from Paris assure us that no unusual illness has occurred, and this is attributed to the very energetic measures adopted by the French authorities in meeting the conditions described. The underground railway has been restored to use, and Paris is enjoying its customary methods of travel, and in all respects seems to be as prosperous and healthful as ever.

DISCUSSION.

Professor WILLIS L. MOORE (Chief of U.S. Weather Bureau, Washington, D.C.): The paper just read was of interest to me, and I will confine my remarks to the portion that treats of the cause of the floods of the Seine. The paper states that there was a great flood in 1658. In 1658 the Seine was practically a wooded area; the economic conditions were quite different from what they are now; the valley has been divided up since and forests have been cleared away, and in place of the covering of trees there has been substituted, not a denuded region (a term so often misapplied), but another form of vegetation—growing grass, grains, fruits and flowers. And instead of the forest area, with its deep roots penetrating into the substratum, and in a way cultivating the soil, we have substituted a broken, permeable soil, which is ploughed and cultivated many times. Now it is significant that when the valley was entirely wooded the flood of 1658 was higher than the recent flood. It is the history of the Danube, of which we have very good records for 800 years, that as the forests have disappeared and as the valley largely has been changed by the work of the husbandman from a forest area into a broken, permeable, cultivated area, the floods have consistently, persistently decreased.

The records of the Government engineers of France for 250 years, dividing that 250 years into five fifty-year periods, show a steady decline in flood intensity in the valley of the Seine with each fifty-year period. We have records of no such length of time in this country, but, for the periods for which we have records, measurements of flood heights show that there is no increase in the average height of floods, or the extreme height of floods; neither is the low water lowered during the summer as the result of the cutting away of the forests. Now, this seems almost like heresy, like sacrilege of a dearly beloved theory, to express any such opinion. If you will look in the "Encyclopædia Americana" you will find an article of some nine or ten pages on Climatology, of which I am the author, in which I state that it is my opinion that there has been no change on any broad scale in the climate of the United States as a result of deforestation; that there is a better economic employment of the rainfall by the forests; and that the cutting away of the forests augmented the floods; that they maintained better the low-water stages during dry periods, by restraining the precipitation and allowing it slowly to percolate into the soil—holding it back—decreasing evaporation. Why did I write that opinion? Simply because what I said seemed to be so truthful that it did not require demonstration.

For the last few years I have come against the most stubborn thing for a man with a theory to encounter: I have faced some bold facts that compel me to revise the old theories. Within the past several years I have discussed carefully the precipitation on many of the watersheds of great rivers of the United States. I have studied the gauge readings on these streams, and I find that there is no increase in flood intensity.

So I have been forced to the conclusion that the hand of the husbandman has transformed these valleys, these lovely plains, into as good a conserver of the moisture as the forests themselves. Here is where we have most of our fundamental errors regarding the effects of the forests upon floods. You say, we should reforest the steep slopes of the mountain regions up at the headwaters of the mountain streams to restrain the flood. But the rain that falls on a square foot of the bank of the main stream is just as potent as the same amount falling upon an equal area fifty miles away at the headwaters of a tributary. It is the precipitation that falls on the total area of the basin, and if you will examine any considerable river system, any important tributary to any considerable river system, you will find that the area of the steep slopes in the mountains does well if it equals 5 per cent. of the total area of the catchment basin. It is the precipitation that falls on the lower reaches considerably away from the mountains that mainly causes floods, and if forests do restrain the floods, then it will be necessary for us not to reforest the area of the steep slopes of the mountains, but to reforest the great plains, and turn those regions back into a condition where they will be the haunts of wild animals.

Now, then, I take the position, and have voluminous data in my possession to sustain it, that the forests really do not restrain the floods. "Why?" you say. "Do you mean to tell us that the run-off from an open plain

is as great as the run-off from a thickly wooded area?" Now, I answer, it depends on what you mean; it depends on which run-off you mean. Is it the run-off from a moderate rain or a shower, or the run-off from a protracted rain? The run-off from the open may exceed that from the forest in the case of showers, because the forest may restrain and contain the entire rainfall when it is moderate and there be no run-off and none of it get into the channels of streams, and the function of the forest is therefore to make the low water lower. Take two areas, one smooth as glass, and the other covered by a forest; just so soon as both surfaces are saturated the run-off is equal. Now no floods occur, barring the little, tearing, rushing creeks down steep declivities, until after all surfaces are saturated. Therefore the run-off is equal from the two surfaces at a time when floods are produced and the forest interposes no obstruction.

I have taken the average height of the Ohio River at Cincinnati for thirty-eight years. I have taken the exact gauge reading each day and have taken the average of it for the thirty-eight years, and I will say to you that the figures stand there in my report; they are from the original records of the Weather Bureau; they show that the average for the last nineteen years is practically the same as for the first nineteen. I have taken the average high water for the four wet months of the principal rivers of the Ohio valley, including the Ohio, the Tennessee, and the Cumberland, and I find that the average high water for the four wet months is no greater for the last half of this period than for the first half. I have taken the average low water for the four dry months on the several rivers, and I find the average low water shows a slightly higher flow for the last period than that for the first. I have then taken two stations on the Tennessee, three on the Cumberland, and five on the Ohio, and have counted the number of days that the water was at flood stage for twenty-eight years; so for a period of twenty-eight years I counted the exact number of days at these five stations that the river was in flood. I did not assume some imaginary stage as a flood, as three different investigators who have discussed our data have done. I counted only actual floods, and I found that for the last fourteen of these twenty-eight years there was an average of forty-three days less each year when the rivers were at a flood stage than in the first fourteen years. Now I do not cite that fact to you as an evidence that there has been any such marked decrease in flood intensity as a result of the cutting away of the forests as this statement would seem to indicate. I quote it to controvert statements of many of those interested in forestry that there has been a marked increase in flood intensity, and I quote it as a warning against making general conclusions from inconsistent or too limited data. The heavy rainfall that occurred at the time of the Johnstown flood came in the first fourteen years of this period. That enormous precipitation gave such a greater number of flood days in the first of this fourteen-year period that, while the result sustains my position, I say it is hardly fair to the other side, for it is improbable that for a long time to come we shall again receive

such an enormous precipitation in either one of two periods that may be under discussion. Therefore, while there has been a marked decrease in flood intensity in the Ohio Valley, without a shadow of doubt, during the past fourteen years, in comparison with the previous fourteen years, I do not believe that such decrease will show in the next fourteen years as compared with the present fourteen years ; and I am satisfied that a proper grouping of the data will not show any such increase in flood as three different investigators think they have found. These men have taken 20 ft. as a flood stage for all of the gauge readings that they have discussed, when it is a fact that at no station in the Ohio River basin is the river at flood until it passes many feet above the 20-ft. stage. Now, then, if an investigator is investigating for the purpose of finding whether our floods have increased and assumes a perfectly arbitrary stage of the river to indicate a flood, which every person living on the banks of the river knows is not a flood, what shall we say of the conclusions that are reached by such a line of reasoning?

Now there are great national problems that involve large expenditures and that seriously affect the economic policy of this nation, and will affect it for a long time to come, that are to be settled by a discussion of this problem of the floods of the rivers and the effect of the forests upon the flood of the river. Shall it be settled by resolution of well-meaning people in open convention, or shall it be settled by the cold reasoning of men who have the statistics before them? So far we have been educated to much that we will need to unlearn in regard to the forests and their effect upon the economic questions of the United States. I am of the opinion that long before the forests of the United States are exhausted wood will only be used for ornamental purposes ; cement, steel, iron, broken stone, all these things are coming more generally into use. Cement houses will be of general construction. Think of the better sanitary conditions—cooler in summer, warmer in winter, no fire loss, no heavy burden of insurance, indestructible, imperishable—structures that will practically stand for ever. Certain it is that non-combustible material is coming into use very rapidly. Long before the coal supply is exhausted—and geologists will tell you that they can see ten thousand years' supply visible now, and they know not how much more is hidden—but long before the coal supply is exhausted I predict that by a wise policy of conservation, such a policy as is being strongly put forward by the man in the White House to-day, every natural water right will be protected, and none have been sacrificed under his administration—not one. Kindly deal in facts, not mis-statements. Long before your coal supply is exhausted, by a rational conservation that shall be formulated by the engineers of the nation, by the men who are working and controlling the streams, building reservoirs, building waterworks, building railroads, such men will formulate a policy that will be carried out by actual working scientific men who are competent to handle these problems, and in time the rivers of the United States will heat and light your places of habitation : they will

do the work of the nation; these streams as they run down from their sources to the sea will be utilized to heat, and cook, and do all the labour practically of the nation. By that time you will need no coal; by that time you will need no lumber. Anyway, whether we need the lumber or not, we should not attempt to solve an economic policy by fallacious reasonings, or endeavour to sustain a truth by a falsehood. The Government records do not sustain the position of the enthusiasts of forestry—and there are many noble men and women concerned in forestry—and I bid them God-speed in everything they can do to protect the great national resources, and to protect forests and grow them where they ought to be grown, and that it is not where grains and fruits and flowers should grow. It is a crime to devote any acre of land in the United States to forestry that can and should grow food for the American people. I love the trees, but I love man more; I love the fruits and the flowers better, and the cereal crops better. Now we want these problems settled by such men as are gathered here—thinking men who have no personal motives, who are simply struggling as you are for the welfare of America. We want the truth, and we want a policy that shall be founded upon the truth, not simply upon undemonstrated theory.

Dr. W. F. R. Phillips (of Washington, D.C.): I think Professor Moore, in his remarks, has hit the nail very much on the head, and certainly his confession as to what he said ten years ago or more is the same confession that I have to make. In a short article that I prepared for the Reference Handbook of the Medical Sciences about the same time back I stated the same effects of forestation on rainfall. I did then just exactly what so many of us do, worked on the preconceived idea and did not work with the facts. Now we medical men know what it has meant to us, every now and then, to take something for granted but never go into the facts. We know how many of our text-books are filled with things that are studied by us, and that we have found later were not so. Some one has said that we are beginning to learn that the most dangerous knowledge that we have is not the knowledge of those things that we know are not so, but that which we accept as so, and which later turn out to be not so. It is a credit, I think, to the universal genius of that great scientist, the man who probably did more than any one else to give us a clear idea of the power of science, Darwin, in his voyage in the "Beagle," going through parts of South America, said that he saw in arid regions evidences of vegetation and trees that had disappeared; and instead of saying that the arid regions had come there because the trees had disappeared, he said that the rain had ceased falling and that was why the trees disappeared. Wise observation from the past, unnoticed, and I doubt if any of you recall it here to-day, and yet we find that that great observer took a pretty good grasp of the situation then when he was floating around the world as a young naturalist on the "Beagle."

Now there is another thing that, I suppose, if we had stopped and thought about it, would have put us on the right track of the relation of

forestation to rainfall, and especially to the run-off. Every person working in arid regions where irrigation has to be practised knows that he gets the best results, and keeps the water longest near the surface, and therefore around the roots of his trees, when he works the soil. I remember, in Southern California, when the Climatological Society took its trip there, that in going through the orange groves and vineyards and orchards, we were told that when they turned the water on, it was necessary in order to keep the soil moist to keep the surface broken up, ploughing it, hoeing in all the time. The farmers had found out there that working the soil kept the soil moist, kept the water more in the surface of the earth, and gave better results, and we might have known why it was if we had just stopped for a moment to consider what it meant—this breaking up of the soil. Every one of us who has had to work on a farm—and many of us probably have—has noticed that in digging post-holes, as we dug down into the ground we saw little openings—veins running all around through the soil—and if watching these post-holes, as many of us did, we saw that during wet weather water was pouring out of these veins. Now the result of breaking up of the soil on top was simply to break up the beginning of these veins, and therefore to delay the percolation and drainage of the water down into the subsoil. We now know to-day very well that if we want to keep the surface soil wet and want to stop evaporation from the surface we must constantly break it up, otherwise capillary tubes are formed in the soil. So the very fact of cultivating the soil keeps more water in the soil and prevents a rapid run-off. Now going back a little—and we can demonstrate the facts—we can see that instead of deforestation increasing floods, it really decreases them, and that forestation really should increase them, because it means soil that is not broken up, and therefore has these larger veins which carry the water down more rapidly to the subsoil, and to the impermeable substrata, and thence off into the streams.

The effect of floods upon health, of course, is one that we are most interested in, and is one that we cannot very well discuss—that is, we cannot say very well how floods *per se* are going to affect our health at present, because we have learned that a good many of the diseases, certainly those most injurious to us, come from things that the flood has directly nothing at all to do with. The fact is that we clean up after a flood, and in so doing we clean up these causes of disease—bacteria—while cleaning up the mud and *débris*. It probably will be shown in this Paris flood that the flood has, hygienically, been of not as much significance as a drought.

Dr. JOHN W. BRANNAN (of New York, N.Y.): I unfortunately came in so late that I only heard the last part of Dr. Hinsdale's paper. I noticed what he said as to the possible effects of the flood on the health of Paris. About ten days ago the *New York Medical Record* had what appeared to be accurate statistics as to the increase or decrease of typhoid fever after this flood as well as after former floods. And, strange as it may seem, there is less typhoid this year than usual at this season, and that was also the case after the preceding floods, and it was given as an explanation that the

precautions which were taken to avert this threatening danger had led to improved sanitary conditions. These precautions had been the exercise of sanitary measures, such as boiling the water, the lessened use of fresh vegetables, which are liable to transmit infections, and such other measures as may have been taken. Of course it is important for us Americans to know what we are to expect in Paris this year, as many persons are making plans for visiting that city this summer. I have heard also from friends in Paris that what was stated in these figures that I mention is true, that there is really less sickness in Paris than usual.

The very interesting talk of Professor Moore, followed by the remarks by our own Dr. Phillips, leads me to suggest that for our meeting next year at Montreal we should make a special study of climate such as this Society is supposed to have in mind at all times. Dr. Phillips has not neglected it, and we always expect him to tell us something about it. It might be well to have a symposium on this special subject: The Relation of the Forest Growth to the Increase or Diminution of Floods. I remember when Professor Moore's statement was published a month or so ago that he expressed views opposed to the generally accepted opinions. I did not know that Dr. Phillips shared those views, but he has certainly made it very clear to-day that he has good foundation for the position that he has taken.

Dr. J. H. Elliott (of Toronto, Canada): This discussion has cleared up many things which were very indistinct in my mind; but there is one question I would like to ask Dr. Phillips in the absence of Professor Moore: They have explained why deforestation does not increase floods with a heavy precipitation of rain; nothing has been said of the floods due to the melting of snow. During the winter in Northern Ontario and the Northern States there is an average precipitation of snow of about 100 in. In the open and cultivated areas this runs off very rapidly in the spring, as we all know, and gives us spring floods. Is the flood not less in the forested area, where the snow melts much more gradually? In other words, though deforestation has no effect in increasing floods due to rain, does it not increase the spring floods due to melting snow?

Dr. W. F. R. Phillips (of Washington, D.C.): In answering the question I would say that in case of snow it would be apparently a fact that the forests by the shade that exists there, not very much shade, not very dense, but that such as does exist there, would interfere to a certain extent with the rapid melting of the snow. Consequently it would have the same effect as that of a gradual rainfall, producing a state such as accompanies a light rain extending over many days as contrasted with that of a rain that came up and lasted only a day or two days. We could conceive that under these conditions the percentage of forest, or anything that would shade the snow, would act in the same manner. But I think that the point made by Professor Moore was that the greatest part of the effective rainfall was that that fell near the stream, and not that that fell at a long distance. I think every one of us who has had opportunities to

watch the run-off in small streams, to watch it after a thunderstorm, has observed that the highest water is reached a few hours after the thunderstorm and not many hours after. In other words, it shows that the run-off that has made the rise or flood in the stream has come from a practically short distance—it was the near run-off; the other run-off would have come from the distant mountains and it takes days for that water to reach the streams and produce floods; that the run-off that makes high water in a stream is really from that near it, and therefore the effect, so far as the practical question is concerned, of the forests in retarding the melting of the snow that existed in them, is negligible.

Dr. C. L. MINOR (of Asheville, N.C.): I rather fear to rise and speak after the scientific remarks of Professor Moore and Dr. Phillips, but there is one thing which I should like to ask the Doctor. In our mountain region of Western Carolina the hills are covered with many beautiful forests, although these are lessened with the advance of the lumberman. All through these forests there is a dense, thick undergrowth with laurel and rhododendron and moss, and dead leaves, still probably as primitive as it was in the days of Moses. At any time of the year, if you go in these forests and examine the soil under these, trees you will find it damp and moist, and when the rains fall they do not rush out from the woodland fastnesses (although the mountain streams, it is true, swell), but to an ignorant layman seem to be taken up and held back by the undergrowth, which in turn is protected by the forest in which it grows. But where our lumbermen have been active and have bared our hillsides, as they have also in parts of Central Pennsylvania, the soil is not moist save immediately after a rain, the streams do not run even in the driest weather as they do in the forests, but we find only dry beds, and when the rains come you see the water tearing down the hillsides, gullying them, washing them out, not sinking into the soil, which will be bone dry the day after such a rain, but going down to swell our rivers and raise them to flood height, destroying the property along their banks. Such are the results of my ignorant observations, but after I hear Professor Moore and Dr. Phillips, who tell us that the forests can have no possible effect of this sort, I wonder if it would not be wiser for us to bare all our hills of trees, to get rid of all our forests, and to trust to the Professor's theories to protect our lowlands and to give a steady supply of water to our mills.

Dr. W. F. R. PHILLIPS: I would suggest to our good friend from Asheville that if the forests are, at the present time, in the same condition that they were at Moses's time and have been during that interval, if he could only give us the records and actual measurements throughout that long period, we might change our views again. I know I have changed mine, and the Chief of the Weather Bureau has changed his; we have both changed our views, and might both change them again. I think the explanation, however, of Dr. Minor's difficulties could be found. First, however, at least before I would attempt to explain

them, I would ask him to bring the records, the actual measurements, because sometimes local floods occur simply because a very heavy thunderstorm occurred just over the region in question, and it may be a coincidence that two or three storms occurred over a particular region, and they got a flood there; also when trees have been cut away you observe these floods more than when the trees are thick and hid the extent of the overflow. If the forests are just as Moses left them, who has been there to see whether the streams were high or low? If the doctor will have the measurements given to us we will try to explain it. I know—we all know—that just working on one's impression, taking some man's impression for a fact, is not satisfactory, and every now and then we have to go over and change our impressions.

Dr. MINOR: Then you will admit that the water runs off faster on these forest-clad hill-tops than its runs off the open?

Dr. PHILLIPS: In about half an hour after a heavy rain the surface soil is all permeated, and for all intents and purposes it is the same, whether it is forested or deforested. A half-hour of rainfall and the run-off will depend entirely upon the slope rather than anything else.

Dr. MINOR: It seems to me we should pray for rain and take the trees up at the foot of the hills as they are washed out.

Dr. HINSDALE: I only wish to thank Professor Moore, and say that I appreciate his coming here to add so much to the interest of this subject which I introduced. I get reports from Paris on good authority that no unusual sickness has occurred, and that it is attributed to the very energetic methods adopted by the French authorities in meeting the conditions; the underground railway has been fully restored to use, and it was filled with water, and Paris seems to be enjoying health. Before publication I may get some actual statistics of the mortality of Paris for the first six months of the present year, and will be able to compare it with that of the previous year.

NATURAL AND ARTIFICIAL OR HOUSE CLIMATES.

BY W. F. R. PHILLIPS, M.D.
WASHINGTON, D.C.

OF recent years, in not a few papers and discussions upon the therapy of certain diseases in which climate has been accepted as the most important of our curative agencies, opinions have been freely expressed that it is not a therapeutic agent at all, that it only existed as a name to conjure with or to cover up ignorance or worse. Now I take it that this Association is not of this opinion; on the other hand, that the Association holds that there is something curative in climate, and that climate itself is an entity capable of being beneficially used as such in the treatment of certain diseases in particular, and, in a less degree, of diseases in general. Certainly this is my own opinion, and I am convinced that it is based upon facts that have been, and can be, experimentally demonstrated. Yet I am obliged in all fairness to admit that the discreditors of climate in therapeutics have a *prima facie* case, and that because there has been no clear understanding or agreement among the protagonists of climate as to what the concept should stand for.

This want of agreement I have referred to once before in a paper[1] before this Association, and can do no better now than to again state that "The word 'climate' is not used in medical literature with the rigorous exactness demanded by science. It is unfortunately necessary because of this lack of

[1] President's Address, *Transactions*, 1905.

precision in usage for every one having occasion to write of climate, if he wishes to be clearly understood, to define what phenomena he includes in the term" ; and, further, "If we are to proceed scientifically in our investigations of the application of climate in therapeutics, obviously we must agree that climate shall always, and to all of us, be one and the same group of phenomena. The different elements of items together making up the group may, and of necessity will, vary in intensity within finite limits, but not one of them must under any condition be omitted from the group or pass without the scale of measurability." In order that what follows may be understood and criticized understandingly, it is necessary to state what I mean by "climate." I shall adopt the general definition given by Hann in his "Handbook of Climatology": "By climate," he says, "we mean the sum-total of the meteorological phenomena that characterise the average condition of the atmosphere at any one place on the earth's surface." This is a brief but comprehensive definition, and I shall take it for granted that it is not necessary to enumerate or explain the activities of the several factors that go to make the climate of one place differ from that of another, or to itemize the meteorological phenomena that collectively constitute "climate" as here defined. Such statements regarding these factors and phenomena, and their modes of operation and manifestation as may be made, will be in the nature of reminders—memory savers—thrown out merely to facilitate the progress of the argument. Climate, as here understood, is an entity, but one that changes its phases according to the operations of general causes and local peculiarities. I would emphasize the fact that by this definition climate is an attribute of atmosphere irrespective of the dimensions of the area or space considered; and, further, that it is the sum-total of the physical, and to a certain extent of the chemical, conditions of the atmosphere of the given place. From the foregoing

definition any and every place on the earth's surface, using that term as generally understood, that has an atmosphere, can and does have a climate. Among the larger climatic areas of the temperate zone, we recognize in what we call the general climate of New England, for example, the fact that there are decided local differences; for instance, the average atmospheric conditions of the White Mountain region are very distinct from those of the Massachusetts seashore. Going into more detail, we know that the hills and elevations of the White Mountains have different climatic characteristics, though minor, from the intervening valleys; that the seashore climate of Massachusetts differs materially accordingly as we consider the eastern or the southern littorals; and so we could go on sub-dividing the large atmospheric area overlying New England, and we could carry our divisions to almost any assignable degree of smallness, only to find that there existed climatic differences of equal smallness but nevertheless of equal distinctness. We may compare not inaptly the climatic divisions and sub-divisions to a large ocean wave with its surface marked by smaller waves, and these by still smaller down to what we call ripples, but each and all being a part of and constituting the manifestations of the general and special influences producing the primary disturbance. It is to these finer sub-divisions of climate that I wish to direct your attention, because there seems to me to be a strong tendency to ignore them altogether and to consider that climate exists only for large areas and in large differences; in other words, that in order to get climate we must go somewhere hence, and generally a long way hence, in search of it, whereas in reality we have it always at all places and cannot escape from it, go where we will. Now there is, if I mistake not, another tendency, and that is to consider that climate is necessarily a purely natural product and that it can in nowise be an artificial one—one due to man's direct or indirect activities.

Probably this is the most important phase of the whole subject that we, as physicians, have to consider. Elsewhere[1] I have indicated in a schematic classification what, in my opinion, should be distinguished as artificial as opposed to natural climates. These artificial climates are the average atmospheric conditions of our buildings of all kinds, our habitations, our factories, schools, theatres, assembly halls, &c., and the aggregating of such into villages, towns, and cities, and of all other natural environments rendered abnormal or artificial by, or as the result of, man's activities.

It needs no statistical tabulations to convince anyone that the atmospheric conditions of houses of whatever sort are different in a greater or less degree, but always different, from the prevailing conditions in the outside open air. It is also all but self-evident that the general characteristics of habitations and the degree of difference between the atmosphere of habitations and of the open, are determined by the general characteristics of the climate of the region in question. A study of the details, and even of the styles, of architecture prevalent in cold and in warm and tropical countries will at once convince us of these facts without the necessity of instrumental measurements. Considering a moderately cold climate, such as that of the general winter climate of New England, it is evident that the exigencies of the weather impose upon its population the necessity of their living the greater part of their time in an atmosphere the average physical conditions of which are very, very far from being that of the average of the open atmosphere of the region. The population of New England is living the greater part of the winter in a house of artificial climate the general characteristics of which differ less from that of the like climates of the inhabitants of the Dakotas, or even Western Russia, than does the general winter climate

[1] "Handbook of Medical Sciences," 2nd Edition, art. "Climate.

of Northern Vermont differ from that of Southern Vermont. And this similarity of house atmospheres is not only true of the instances cited but of all other regions having cold winters. It is for this reason, I think, similarity of artificial climatic environments, that we find such general uniformity in the morbidity of all moderately cold climates. As giving some concrete idea as to what the difference may be in two of the easily measured elements, temperature and relative humidity, I shall quote the results of a series of twenty-one consecutive observations reported by R. De C. Ward, and made in Cambridge, Mass., November, 1899: Mean temperature indoors 69° F., out of doors 36° F.; mean relative humidity indoors 30 per cent., out of doors 71 per cent. And to afford a striking contrast, let me give the average mean out-of-door temperature and humidity of the month at Yuma, Arizona (one of the most extreme of our climatic stations), which approaches nearest to the indoor conditions observed in Cambridge, Mass., in November. The values are as follows: Average mean temperature of April, at Yuma, 70° F., average relative humidity 39 per cent. If a jinnee were to pick one up suddenly in Boston on an average November day and immediately set him down in Yuma, it would be admitted that there had taken place a change in one's climatic environments; yet in the colder part of the temperate zone during the winter we find the population living alternately in every twenty-four hours in two such extreme conditions of atmospheric surroundings that it would take thousands of miles of latitude to produce. And there are people who would have us believe that these inhabitants were independent of climatic influence, and if they wanted a change of climate they would have to go somewhere else to find it. Considering the artificial climates that result from man's efforts to escape the rigors of the natural climate in which he chances to be, especially the house or habitation climate, we find in it atmospheric

conditions as characteristic, as fixed, and as definite, with respect to the influence upon them of the several parts and properties of the building, as we find in the natural climate of the region with respect to its climatic factors. Let us but contrast mentally, for a moment, our sensations as to the atmospheric conditions we find in a basement room with one in the attic, and then the intermediate conditions that obtain between these two extremes; then let us consider the differences obtaining in houses of like design but of different exposures. I think we will admit after considering all these facts and phases thereof that we have certain average conditions of the atmosphere in our house that are deserving of being called climates, and that these climates are largely postulated by our outdoor atmospheric environment, or climate. Indeed, we may sum up the whole problem of heating and ventilation by stating it to be a struggle at adaptation to climate. There is no escape from this thing that I call "climate." When we close or open a window, when we build or put out our fires, when we wear overcoats or negligé shirts, go to the mountains or the seashore in summer, or to the city in winter, we are silently and unconsciously acknowledging that there is climate, and that it has an influence on us. When we send our consumptive patient out of the city to the country, mountain or plain, seashore or sanatorium, from the basement of a tenement to its roof, or from an area room to the fire escape, we are again recognizing climate. All this is not new—it is old, very old, but it is true. What we need is to know more about these old things—to know their physiological actions, direct or indirect. It is very easy to say what we need—it is often hard to get it. What we sorely need in medical climatology is laboratory experimentation. Who can tell us to-day what it means to our organisms to sit for an hour in a gentle breeze, or who knows the measures of the changes and energies that are called forth when we step from our comfortably heated rooms, at about 70° F., to the out-

of-door winter air of 0° F. or maybe lower; or what it means to work for hours in the open on a winter's day, and then in a moment return to spend the remainder of the twenty-four hours in the summer temperature of the house, without the summer freshness and purity and humidity of the air?

I do not wish to exalt unduly what I mean by, and have called, "climate," but that which I mean has surely a therapeutic place in our materia medica, and if we are to use it rationally we must study it rationally. When we realize, as I believe we shall, that after all we are ourselves just what largely we are made by our protoplasmic responses to the physical and chemical conditions of the aerial ocean at whose bottom we live, we will find that the activities of our Association cannot and should not be limited to working in our present somewhat narrow pathological and therapeutic fields.

THERAPEUTICS OF COLD IN COLORADO.

BY DR. CHARLES FOX GARDINER.
COLORADO SPRINGS, COLORADO.

IN the study of heat and cold and its effect upon man, as shown by the varying temperature of the air and soil under different meteorological conditions, we have a subject too vast, complex, and unknown to discuss in a medical paper. Therefore, one has to limit the subject to the simplest questions, such as the effect of the heat of summer, or the cold of winter, upon tubercular invalids in a given locality.

As the surface of the earth presents so many localities that are intensely cold, as in the Arctic regions, or very hot, as in the Tropics, one would reasonably expect to find much useful information in the study of the inhabitants of these regions as to their ability to resist tuberculosis due to the factors of temperature. It is found, however, that such studies may be misleading unless all conditions are carefully studied. All native races, such as the Esquimaux or the Indians, the races of the Pacific Islands, &c., as far as we know, were practically free from tuberculosis until their contact with the white races. Given contact enough, which insures "carriers" among themselves, in all instances the disease seems to be disseminated apparently as rapidly above the Arctic circle as under the Equator, due no doubt to natural non-immunity. But, on the other hand, a more detailed study will show that the geographical distribution of phthisis has its lesson to teach us regarding its effects of heat and cold in that disease—for instance, the reports in India show the mortality from

this disease in the lower plain countries, where moist heat is a prominent feature in climatic conditions, to be very large, while in the Western Ghauts, at elevations of 4,000 ft. and over, where the general temperature is much cooler, although the moisture remains still in excess, it is a very rare disease. Again, in South America, very much the same relation between heat and cold is found; through Brazil in the low, warm plains the disease is prevalent, while in the mountains of the Argentine Republic and Bolivia the disease scarcely exists, the habits of the natives in house ventilation, crowding, and other matters remaining much the same. It has been noticed by many travellers that while above a certain elevation in South America the disease is almost unknown, on descending into the low valleys of the Andes it is again very prevalent, so much so that the natives on descending to the warmer countries from the heights frequently contract the disease, but if they return to the high plateaux and the cold air soon enough they recover. It may be supposed by some observers that this immunity at the higher altitudes observed among the natives may be more due to isolation and lack of "carriers" than to the influence of cold air or altitude, but when one considers that there are crowded cities at these elevations subject to the same lack of hygiene, inhabited by the same race, with the same habits as in the lower sections of the country, and that the immunity to tuberculosis still persists to a very noticeable degree, one is forced to the conclusion that there must be some climatic influence at work producing an increased resistance to the invasion of tuberculosis. Also, it has been noticed that in the Tropics not only is the disease prevalent but it is of a specially malignant type. This occurs not only in natives who inhabit the country, but also in the natives of temperate climates who inhabit it temporarily [1].

Latham says: "It has, however, long been known tha

tuberculosis runs a relatively rapid course in warm climates, and that patients who gain and improve in weight during the winter lose ground as soon as warm weather sets in."

As to the effect of heat and moisture upon a disease such as tuberculosis, the reports from our military and naval surgeons serving in the Tropics all testify to the fact that climatic factors are of immense importance. The white man, over and over again, has, under such climatic conditions, developed an acute, pernicious form of the disease; latent cases burst into violent activity; and the only way to save life is at once to remove such patients from the deadly influence of heat and moisture; and what is true of the Tropics as bearing on tuberculosis is also true in a more limited sense of other climates where dampness or heat act as exciting agents in producing the disease.

From these facts it would appear that cold, elevated, and dry regions act favourably on phthisical patients, although this has been doubted by some phthisiologists. It does not do for us, however, to consider cold the only factor in this favourable influence. It apparently must be a combination of cold and dryness, because in certain parts of North Greenland along Hudson Bay, Labrador, and other so-called cold countries the disease is known to flourish to an unusual extent. In addition, however, to the damp cold, the inhabitants of these regions are frequently poorly nourished and crowded in close, badly ventilated habitations during the winter, and the study of the native races in regard to the effect of cold or heat in tuberculosis must be taken with considerable caution, as, for instance, the Esquimaux living in the most intense cold were practically immune until the advent of the white man among them, yet they lived in excessively bad air in their snow igloos; but their chief diet was fat and meat. On the other hand, the savages of the Pacific Islands, living in the warm, open air day and night on a low

proteid diet of yams and fruits have, also, since the advent of the white man, been decimated by the disease, as in Hawaii, Fiji, Tongay, and Samoa. It is, therefore, probably only with the civilized white man from the temperate climates, who has been rendered more or less immune by centuries of exposure, that we can accurately measure the effects of heat and cold in tuberculosis. And here most observers seem to be of the opinion that cases developing among them have a more pernicious type of the disease and run a more rapid course under the conditions of heat and moisture than under cold and moisture, and are more resistant under conditions of cold and dryness with elevations, as in the Andes, Himalayas, Rocky Mountains, Swiss Alps, &c., over 5,000 ft. altitude.

As a general law, cold is apparently of benefit to the human race, mortality decreases from the Equator to the poles, due, it is true, to restriction of bacterial growth at low temperatures and lack of hygiene [2], but also due to the tonic effect of cold climates; cold increases body oxidation and metabolism and the desire for proteids and fats [3]; more water is exhaled from the lungs as the cold air is drier [4]; the respiratory quotient is changed—the gaseous interchange in the lungs is increased, due to increased metabolism; heat diminishes arterial tension, metabolism is less rapid [5], as hot air contains less oxygen than cold, and carbon dioxide is not exhaled to the same amount as in the cold air [6].

It is rather interesting to study the gradual change of opinion among medical men during the last century in their ideas relative to the open-air treatment of tuberculosis, summer and winter. I have a copy of a letter from the famous Benjamin Rush, of Philadelphia, dated 1812, and written to a patient who was ill with phthisis, giving him detailed instructions as to his course of life. The patient was living at Catskill, N.Y. "Spend the winter months in a large room,

warmed by a close stove ; not only sit and eat during the day in this room, but sleep in it. Its temperature should be between 65° and 70°." What the celebrated Rush would say, could he now see the consumptive patient on the porch of the nearby sanatorium sleeping out in the depth of winter, would be worth recording. For many years cold was considered a danger to the tuberculous ; winter weather was avoided in every way possible, and the only climate advised for the phthisical patient was one as near the summer temperature of the Temperate Zone as it was possible to find. Even twenty years ago English doctors sent their chest cases to Menton, Azores, or the Canary Islands, and no doubt many cases did improve in the balmy air of such localities, probably being in the third stage of the disease when ordered away from the fogs and bleak winds of an English winter. In our own country some of us can remember when Florida was considered the one Mecca for the tubercular invalid during the rigours of a northern winter ; and it is comparatively only in recent times that the cold air of winter was found to be of benefit. Such pioneers as Drs. Dettweiler and Brehmer in Switzerland, and Drs. Trudeau and Bowditch in this country, boldly advanced their ideas, against considerable opposition, and stated that they had found the air of cold wintry days, taken with proper precaution, beneficial and curative in many cases of consumption, and of more certain effect than the warm air of semi-tropical resorts [8]. Other observers then discovered the same truth, and, encouraged by the success obtained in placing patients outdoors all day, often with snow on the ground, and a temperature nearly at zero, began cautiously to extend this cold air treatment to include the hours spent at night in sleep. This experiment seemed at first a hazardous one. The tuberculous invalid certainly had a lowered resistance. During sleep the vital energies were at their lowest ebb ; to spend the cold, freezing

nights outdoors even in a well-blanketed bed seemed in those times a rash procedure to advise any invalid to undertake; and yet we have all seen how, in the face of opposing theory it has succeeded, and not only has succeeded but has come in a trial of comparatively a few years to be the standard treatment now insisted upon at most sanatoria and health resorts. And we see everywhere porches erected to be used in treating cases of consumption, summer and winter. In fact, as far as the history of treating phthisis is concerned, the evolution has been directly towards the more frequent and thorough use of cold air of winter even during Arctic temperature.

In Colorado, at an altitude of 6,000 ft., we have rather a favourable opportunity to compare the effects of warm and cold air and its effects upon tuberculosis. There are not so many disturbing factors to make the comparison between the seasons so unequal. The difference in the summer and winter, apart from the actual temperature, is not perhaps so marked as in many other health resorts. During both seasons in Colorado dampness, such as occurs in the atmosphere and soil, is more nearly the same. We have generally but little snow-fall; during the average winter it is not a marked factor. It is very rare to find large areas of snow melting into slush. It almost never rains in winter; watering-carts are used to lay dust during the entire year in several of our cities. We also, fortunately, avoid periods of damp, so-called muggy days—days in which even a moderate temperature is so trying; and we never have the exhausting heat so common in lower altitudes—days in which no relief can be found. Our nights are cool even in summer.

The wind velocity is well distributed during both seasons, and our hours of sunshine are also constant factors, both summer and winter. We are, therefore, in a position to be able to judge rather more definitely than one can in most sections the actual benefit or harm that high or low temperature

has upon the health of tuberculous invalids. As for the invalids themselves, their exposure to the outdoor air is also a constant factor in both seasons, as the cases I have been observing spend the entire time out of doors, both day and night, winter and summer. If I may be pardoned for referring to the subject, in Colorado we were among the first to utilize the outdoor air, and especially the night air, in treating the tuberculous. I had patients sleeping out of doors in 1884, and the late Dr. S. E. Solly preceded me for some years in using the method. My impression has been that, at least as regards the dry air of Colorado, the cooler temperature of the winter season has several advantages in the treatment of pulmonary tuberculosis over that of the warmer air of summer. The general tonic effect of cold, provided a person is properly protected and well-fed, is too well known to be mentioned here. To take an extreme case, one has but to compare the difference of a tubercular patient during dog days, or, what is called a "spell of warm weather," such as is frequently seen in our Eastern cities. Such a patient, even when sleeping out-of-doors, would be more or less debilitated by a warm night, have a feeling of oppression, and liability to night-sweats and restlessness; while the same patient sleeping out in a frosty wintry night will awake refreshed and invigorated, with an appetite for breakfast, the heat acting in one case as a distinct depressant, in the other as a marked tonic or stimulant. Another point, I think, worth considering is, that avoidance of indoor air in winter is more important to a tuberculous invalid than indoor air in summer, as the house air of winter is vitiated by artificial heat, which creates an irritating atmosphere. During the winter in Colorado a tuberculous patient has the advantage of being able to enjoy sitting in the direct rays of the sun. This advantage, I know, will by some be considered of dubious benefit. We are warned, in a number of impressive articles, against such unprotected exposure of the heat rays as causing

many ills [7], but, nevertheless, from a practical, everyday experience, in a country where there is an excessive sunshine, I have found direct sunlight of much benefit to my patients, provided the weather was cold and they had proper protection for the head, the eyes being shaded from all glare arising from sun or light surfaces. Possibly the rays of the sun are diffused through the clothing, and affect the blood cells circulating in the capillaries [9]. Of this, however, we have no positive proof. On the other hand, during warm weather, this advantage from sunlight cannot be utilized to the same degree, as it is apt to produce languor, headache, and direct injury. Latham says, "The sun is an amenity and a cordial. Rienzi has shown it lengthens the lives of animals affected with tuberculosis." Another important point connected with the cold in winter is the fact that almost invariably it stimulates the appetite. The weight of healthy individuals has been known to increase during cold weather in a distinct ratio [10]. In the tuberculous invalid the same conditions hold true; they are more apt to gain by reason of increased appetite during cold weather, and, therefore, one of our most important considerations in treating the disease is obtained — the rapid building-up of new tissue to overbalance the rapid waste of issue. How often do we see patients during the summer months become languid, lose their appetite, especially for proteid food; and then upon the return of the cold, crisp days of fall we see a marked change in their condition, appetite improving, and weight beginning to increase. The temperature of patients suffering from tuberculosis tends to be higher during a heated term, such as summer. Why this is so is rather a problem, the temperature of the air probably having no direct effect upon the clinical thermometer. It is, of course, well known that temperatures taken in the mouth out of doors in winter will be lower than when taken indoors or on a warm day. But even when precautions are taken to avoid

this error (such as taking the temperature in the rectum indoors), it has been found by us in Colorado that patients with a temperature above normal will show a higher range during hot weather, probably due to the exhausting effect of the heat.

The comparative results between winter and summer in the case of pulmonary hæmorrhage are too uncertain for any man to generalize upon unless he has more statistics than I have, but my impression has been that more hæmorrhages have occurred, in my observation, during the cold weather of winter than in summer. Many causes probably contribute to this, but I have been more than once impressed with the fact that patients leaving the freezing air of out of doors and entering a warm room would, within a few minutes, have a pulmonary hæmorrhage [11].

As to night-sweats, they have certainly occurred more frequently during warm weather, possibly due to the relaxed condition of the skin, or from lack of tone induced by heat. The general impression among patients in Colorado is to the effect that they gain more in the fight against tuberculosis during cold weather.

Conclusions.

(1) The geographical distribution of phthisis shows the benefit derived in tuberculosis by individuals living in dry, cold, elevated regions; also that all races have a more rapid and pernicious form of tuberculosis in damp, warm regions.

(2) Historical records show a gradual change in the attitude of medical men in favour of cold winter air in the treatment of tuberculosis.

(3) In Colorado the seasons are more constant, and their comparative effects upon tuberculosis more easily obtained than in many climates.

(4) The cold of winter stimulates more than the heat of summer.

(5) Sunlight more available in treatment during cold weather.

(6) Weight increases in winter.

(7) Nutritious diet more easily taken by invalids in cold weather.

(8) Tubercular temperatures are higher during hot weather.

(9) Pulmonary hæmorrhages are, perhaps, more apt to occur in winter, night-sweats in summer.

(10) Invalids are generally impressed with the benefit derived from winter weather.

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THE EMPLOYMENT OF COLD IN THE TREATMENT OF PULMONARY TUBERCULOSIS.

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Specific therapy should, logically, form the basis of treatment of pulmonary tuberculosis. By specific therapy I mean the injection at various intervals of either dead tubercle bacilli, or of the soluble extracts of this germ in its living or dead condition. Such, for example, are the various tuberculins of Robert Koch and of Denys. This method of treatment—the tuberculin treatment—though of considerable value in the hands of some physicians when used in suitable cases, has as yet shown no results which should entitle it to be regarded as the basis of treatment of pulmonary tuberculosis. At present, the hygienic-dietetic or fresh-air treatment is the only one of established value, and hygiene and diet are its chief factors.

It is my purpose to describe how cold, as cold air, may be used to advantage in the treatment of this disease.

First of all let me mention the men who have done so much to establish the value of fresh air in the treatment of tuberculosis. Between the years 1885 and 1860, Brehmer proclaimed from his mountain village of Goerbersdorf that phthisis was curable both spontaneously and also by means of energetic and skilful treatment. His cures grew in number, and through them physicians came to regard the consumptive as a hopeful case, instead of one predestined to perish. It took time for him to overcome the deep-rooted prejudice against cold air. His methods were improved by his pupil, Dettweiler, whose name is associated with the famous sanatorium for the treatment of pulmonary tuberculosis at Falkenstein in Germany.

It is interesting to know that the third great pioneer in the treatment of pulmonary tuberculosis by fresh air, Dr. E. L. Trudeau, of Saranac Lake, New York, had to meet with the same scepticism as did Brehmer. Dr. Trudeau was the first to employ Brehmer's methods in America. But the credit for the first case under winter treatment in the Adirondacks belongs to the late Dr. Alfred L. Loomis, and Dr. Trudeau himself was the first patient. As early as about 1880 he began to treat cases of phthisis in the Adirondack Mountains of Northern New York State. For a number of years Dr. Trudeau had also to combat the prevailing disbelief in the employment of cold air in the treatment of lung diseases. With unfailing faith he held to his methods of treatment, and to-day he has the satisfaction of knowing that he has saved thousands of lives.

To Brehmer and Dettweiler in Europe, and to Trudeau in America, can be given the credit of establishing the great curative value of pure cold air for pulmonary tuberculosis. Their methods, which are all essentially the same, are now employed in all climates, and the curative value of fresh air is firmly established, whether it be used in the mountains, the low levels, or at the sea.

The present-day treatment of tuberculosis is essentially nothing more than to cause an improved nutrition of the body. No single element in the cure, neither air, food, rest, hydrotherapy, nor medicine, affords any guarantee of success. It is only a combination of all these factors that can bring about this result.

It is nevertheless true that hypernutrition is the factor of first importance, and to the influence of cold air in bringing about this hypernutrition we may ascribe the markedly superior results obtained in many patients during cold weather. It is a popular saying in the Adirondack Mountains that one winter is worth two summers.

The employment of cold air in the treatment of phthisis should begin at the same time that the diagnosis is made. By this I mean that the patient should at once be put under rigid treatment. If there be fever, he should be sent to bed and kept there till the fever has ceased, and for some time longer. If there be no fever, he should be sent home and kept at rest in the open air till plans are made, either for treatment at home or to send him away to some health resort. The patient should at this time be carefully cautioned against settling up his business affairs before he leaves for the health resort, or before he begins treatment. He is now suffering from symptoms of his disease, and this is perhaps the most critical time of his whole illness. Many cases are irreparably lost at this time because they try to settle their affairs. This extra tension and anxiety may bring on hæmorrhage or fever, and either of these may alter a good incipient case to an advanced or acute case within a short time. The patient should therefore be put at rest and his arrangements should be made by friends.

Nourishment and air are therapeutically on a par, and one of the fundamental requirements in the treatment of pulmonary tuberculosis is the free use of pure air.

Physicians still possess very vague notions regarding the management of the cold air, and, unfortunately, very often they give harmful advice. The patient should, if possible, spend his entire life in the open air. He derives benefit from cold air not only when the weather is sunny and dry and the wind is quiet, but also when it is cloudy, damp, and when there is wind and rain. There is no basis for the assertion that cloudy and rainy weather are injurious. In many health resorts it would be necessary to keep patients within doors for many days throughout the year if rainy and cloudy weather were injurious. On the other hand, prolonged exposure to the heat of the sun, especially in summer, when

the rays fall vertically, is in many respects injurious, and frequently causes congestion of the head and lungs, and severe attacks of fever. In summer the patient should protect himself from the direct heat of the sun and should seek the shade; in winter he may sit in the sun's rays, provided they are not too warm.

Snow and rain should not interfere with the patient being in the open air, provided he keeps out of the snow and rain by a suitable shelter.

Winds should not be feared, provided the patient is sheltered from them, and provided he also has suitable clothing. He should not, however, expose himself to winds, as otherwise a severe attack of pleurisy may occur.

Even a moderate degree of fog is not harmful unless it is saturated with coal-dust, as in cities. The patient should, therefore, be in the air in all weathers, provided he has suitable shelter from rain, snow, or wind, and has suitable clothing.

The temperature of the air is not a factor of such great importance as was once supposed. Warm climates were formerly considered far more favourable than cold ones, but at the present time cold climates are considered to be of at least equal value to warm ones. There is no doubt, however, that some—the thin-blooded and weak patients—feel better in warm climates.

Rapid changes of temperature and sudden falls should be carefully guarded against. To reduce this source of danger proper clothing should be worn and a careful course of hardening carried out. The consumptive frequently makes the mistake of guarding against falls of temperature by clothing himself too heavily. One will sometimes see a patient with a thick chest protector covering the front and back of the chest, then a heavy woollen undershirt, then a flannel shirt, then a heavy sweater, then a waistcoat, then coat, then

a heavy furcoat. This works in the wrong way, as it maintains a constant sweat, and so makes the skin over-sensitive. For a cold climate such as that of the Adirondack Mountains a woollen underskirt is safe. It should be very thin in the warm summer weather and thick in the winter, but it should not irritate the skin. It thus maintains a layer of warm air, furthers ventilation, and absorbs the sweat. Over this should be worn a shirt, vest, and coat. Women should wear a woollen undershirt, then a shirt which should not be too open, a comfortable corset and a jacket.

The course of hardening is very important, and the patient should get definite instructions as to the cleansing of his body. At the outset of treatment it is usually sufficient for him to sponge off the chest, arms, and back in the morning with cold water. For most patients it is not advisable at first to take a cold tub bath each morning, but to stand and sponge from a basin of water. He should then rub dry with a coarse towel. The rubbing should always be done gently so as not to produce cough or hæmorrhage. At night the legs should be sponged. The whole body is thus sponged each day. Once a week a warm bath at about 95° to 100° F. (35° C. to 37·8° C.) should be taken, and the body soaped thoroughly so as to thoroughly cleanse the skin. A cold sponge should follow. Later on, when a patient is strong, a morning tub bath may be substituted for the sponging. The water, however, should not be colder than it is in summer, say about 72° to 75° F. (22·2° to 23·9° C.).

The above forms of bathing apply to patients who are up and afebrile.

For febrile patients who are confined to bed cold sponging sometimes causes chills, and it is then of advantage to begin with a dry rub in the morning. Dry rubbings were recommended by Dettweiler. The patient is put naked into a large coarse sheet or blanket, and then rubbed by making long,

quick strokes from head to foot. This brings a glow to the skin. The long strokes may be modified by rubbing the extremities and body in turn. At night he may be given a cleansing bath with soap and water, the water being warm so as not to chill. This may be followed by an alcohol rub.

The advice of the physician to his patient with regard to the use of cold air will depend on whether the patient has fever or is free from it. If he be free from fever, we usually advise him to procure proper clothing, a reclining chair, and instruct him to begin the rest cure. He should spend the entire day out of doors reclining in his chair. The semi-recumbent, or three-quarter recumbent, position is advisable, and the legs and feet should be raised. As mentioned above, his head should be out of the sun's rays, and should be protected from the wind and rain. He should be in the air as early as convenient after breakfast, remain out all day, and spend from one to one and a half hours out of doors after the evening meal. Patients who have a weak digestion will often derive much benefit from resting on their beds for half an hour before and after the midday and evening meals. He should be in bed by about 9 p.m. He should exercise great judgment in the amount of air that should be allowed in the room during the night, and should never lose sight of the fact that he goes to bed to sleep, and not to lie awake through the night shivering from the cold. For this reason only sufficient windows should be left open as not to give discomfort. Much harm is done by having too much window open. The comfort of each individual patient is the only guide. Some patients can sleep soundly with several windows wide open on the coldest nights. Other patients can only stand a small amount of cold air even with ample bed clothing. It is far better for a patient to have only a small amount of window open, and to have thereby a good sleep, than to have the window wide open and shiver most of the night. It is to

be remembered that good ventilation of a room is obtained in cold weather with only a small amount of window open. Sleeping out of doors, so popular just now, is of decided advantage to some patients, but is not a necessity. Results do not seem to be better with those who sleep out than with those who sleep indoors. The physician usually leaves the decision to the wish of the patient, but cautions him to be sure and obtain sleep. During the summer months sleeping out is decidedly of advantage.

Should the patient have fever, he will have to be confined to bed. The degree of fever at which a patient is advised to go to bed will differ according to the case. This must be left to the judgment of the physician. There are often circumstances which will influence the physician for or against sending the patient to bed with slight fever. When the temperature reaches 100° F. (37·8° C.), or over, rigid rest treatment should be carried out. The ideal method is to have a balcony connecting with the patient's room, so that the bed with the patient in it can be pushed out from the room. This is very important, as the patient thus avoids getting chilled. We should remember that every motion costs the body albumin, climbing more than walking, walking more than sitting, and sitting more than lying down. The more quietly the patient lies, and the less he moves his muscles, the less substance does he consume. With fever cases, therefore, all movement should be closely limited. If possible, he should lie quietly on the back with only one or two pillows at his head. In this absolute recumbent position the heart beats slower, and the blood circulates more slowly in the lungs, and fewer poisons are taken into the system.[1] This absolute rest is also of value for heart irritability.

The febrile patient should be brought into the open air with the least possible exertion, and the ideal way to do this

[1] Cornet, "Tuberculosis."

is to push the bed from the room through the door leading to the verandah. Hospitals and dwellings for tuberculous patients are now constructed so that the sleeping rooms connect with the verandah and the beds can be pushed out with the patients in them. With fever cases it is very necessary that they be not exposed to the cold air, but that they be pushed out in bed, and not go out to the verandah, and then get into bed. If the bed cannot be pushed through the door, the next best thing is for it to be outside on the verandah, and be warmed before the patient gets into it. It may be necessary to carry the patient downstairs to the verandah, so that he can spend the entire day out of doors.

It is a matter of great importance to know how long to continue this period of rest after the patient's temperature has become normal. This must largely be left to the judgment of the physician for each individual case. A good rule is not to allow the patient up too soon. If he has had fever for a prolonged period, it is often advisable to keep him in bed under the same strict régime for even a month after the temperature has reached normal, and remained so. He should then be allowed to sit in a reclining chair for one half hour for the first day, and then increase by one quarter or one half hour each day until he remains sitting up for the whole day. Should a subsequent fever attack occur he should be put to bed and treated with the same care, and then allowed to begin sitting up with the precautions mentioned above.

Breathing exercises also fall within the subject of the cold-air treatment. Consumptives are usually advised to breathe deeply, on the theory that the air, the oxygen, and the ozone have a curative effect on tuberculous lungs. Very cold air rapidly inhaled is certainly not to be recommended, but breathing through the nose generally obviates any danger. The surgeon does not advocate exercise of a tuberculous joint, especially forced exercise. The same principle holds good for

the lung. Forcible and particularly sudden inspirations may occasion the aspiration of sputum into healthy parts of the lungs and so set up secondary pneumonias.

It is a different matter when the focus has become walled off, and no more sputum is produced. It is then possible that a well-regulated course of breathing exercises may be beneficial.

In my own practice, I do not advise breathing exercises while there is sputum, and in fact regard them as dangerous.

Life indoors should be limited as far as possible, but cannot be entirely avoided. At night, and during fever atttacks and hæmorrhages, the patient is confined to bed, but he should always be given the benefit of cold air.

The conditions which are necessary to carry out the cold-air treatment are rarely satisfactory in the home even of persons of ample means. Even in ancient times patients were sent to reputed health resorts.

At the very outset the questions arise, What cases should be sent away ? and, Where should they be sent ?

For cases in which the treatment cannot be carried out at home, and which have sufficient means, a change to a health resort which has an established reputation for the treatment and cure of tuberculosis is very desirable. My feeling is that all cases that will be benefited by climatic treatment should be sent to such a place, provided they can procure the necessary means. At this place, the patient learns the plan of treatment more thoroughly than he can anywhere else. Though there are a great many successes from home treatment, unfortunately there are a great many failures, and these failures reach the health resort when the balance of health is already lost. If the patient can first go to such a place and get his training, and then continue the treatment at home, I feel quite sure that many lives will be saved.

It is difficult to say what cases should not be sent away

from home, but those cases which have had high fever for some time, and which are much emaciated, and which have no hope of recovery, should not be subjected to the disturbance of a journey to a cold climate.

Fever in itself is no contra-indication, even if high, if it has only lasted a few days or weeks, or if it has lasted for some time, but has not reached a high degree. Change of climate often of itself rapidly cures fever, and patients have often been saved by a change of environment after having been given up. The general tendency is to wait till the fever has subsided, but I consider this not good practice, as I have repeatedly seen fever quickly subside after the patient has reached the health resort. Provided the fever is recent, I think that patients should be sent away at the earliest possible moment, as their chances of living are thereby enormously increased. Nothnagel considers change of climate to be often the only cure for fever, and Brehmer and others have similarly expressed themselves. The annoyance and fatigue of the trip are of secondary importance.

Not only should we send our patient to the health resort when the hygienic conditions at home are unsuitable for taking the cold-air treatment, but even if the home conditions are suitable we should still not under-value the favourable influence which change of climate exercises upon the appetite and nutrition.

Many climates are especially recommended for consumptives, but no one climate can be regarded as specific. Recoveries from pulmonary tuberculosis are seen in every climate, and an examination of results from different sanatoria of acknowledged reliability shows that there are about the same results of cured cases from sanatoria in warm climates as there are from cold ones. I have no facts to substantiate the following, but my impression is that tuberculous patients who live in cold climates do better in their own cold climates than

they do in warm ones. I have also observed that patients from warm climates do excellently in cold climates. These latter patients may do just as well in the warm climates as in the cold ones, but of this I have no knowledge.

Modern methods of blood examination have demonstrated an increase in the red blood cells of phthisicals in proportion to the altitude. A number of hypotheses are advanced to account for this blood condition, but further investigations are needed on this point. Three very important factors contribute to this improved blood condition. The patient is put in the air, and has the effect of air and light increased enormously over its former employment. In addition to air and light there is the suralimentation. These three factors, air, light, and suralimentation, will tend to increase the blood-content in any climate.

Dangers in the Employment of Cold.

The employment of cold air in the treatment of phthisis is not without some danger, and certain things have to be guarded against. In the first place, the patient should be protected from the wind by a suitable shelter, as otherwise a sharp attack of pleurisy may occur. One would think that bronchitis and pneumonia would naturally be produced by exposing a delicate consumptive to cold air. Such is not the case, as the bronchitis from which the patient is suffering at the onset of his treatment will often diminish very rapidly when he is constantly in the cold air. Should a patient, however, get an acute bronchitis during his cure-taking, this should be treated by putting him indoors so as not to expose him to the cold air. At this time the bronchial tubes are acutely inflamed, and we should not expose him to a further irritant by inhaling cold air. When the acute condition has ceased, he can then be again put out in the air with safety.

Pleurisy is perhaps the most common discomfort that the

patient suffers from while taking the cold-air cure. It occurs mostly as a dry pleurisy, which lasts a variable time. To guard against it two things are important: first, the patient should be properly clad as described above; and, secondly, he should be protected from the wind while sitting out. Fortunately, the attacks of pleurisy are usually not serious. The same precautions should be taken to guard against pneumonia. I can only recall one case of lobar pneumonia which occurred in my practice. From this it is seen that pneumonia is an exceedingly rare complication while patients are taking the cold-air treatment.

Colds in the head are to be avoided, but are also comparatively rare when patients are constantly in the cold air. Many patients will pass a whole year without contracting a cold, but a few seem to be more subject to them. With proper clothing and the avoidance of draughts, and the use of cold sponging, patients can largely avoid catching cold. The great precaution is to be in the cold air all the time. It frequently happens that patients who have been free from colds for long periods will at once contract a cold when they visit the city. This may be due to the impure air and infections of the city, and also because they are over-tired by the extra exertion occasioned by the change.

Muscular rheumatism is induced in heavy eaters who are careless about dressing warmly. It may, however, be controlled by massage. Inflammatory rheumatism is occasionally met with, but is rare and is almost always of very mild type. With such patients proper clothing is the important point to attend to. In the fall of the year chilblains are frequently complained of. With such patients the feet should be kept dry and warm, and some such lotion as a 2 per cent. formalin solution applied several times daily. Calcium lactate, as recommended by Sir Almroth Wright, may also help.

Lastly, loss of sleep should be guarded against. To do

this, we should constantly impress on the patient that he goes to bed to sleep and to be comfortable, and that he should not be exposed to sufficient cold to keep him awake. In extremely cold nights the air is sometimes so stimulating that sleeplessness is induced in patients who are perfectly warm in bed. To overcome this they should have their rooms warmed, or sleep indoors, if they were sleeping outside.

The employment of cold air in the treatment of pulmonary tuberculosis should not be extreme, but should be carried out with the greatest possible judgment and intelligence.

(For discussion of this paper see p. 99.)

THE EFFECTS OF HEAT AND COLD IN PULMONARY TUBERCULOSIS.

By CHARLES L. MINOR, M.D.
ASHEVILLE, NORTH CAROLINA.

THE therapeutic effects of the temperature of the air on those suffering from pulmonary tuberculosis are evident enough to physicians occupied in treating this disease, yet when we seek to analyse them we find that it is easier to record our impressions than to demonstrate scientific truths.

If, however, the acceptance of a therapeutic measure had to wait until the scientific theory behind it had been fully worked out, the advance of the art of treating disease would be even slower than it is. Of course, as far as is possible, treatment should rest on scientifically tested facts, and all physicians hope for a day when all simple empiricism shall be banished from our practice, and the justification of every therapeutic procedure will rest on a scientific demonstration of fact. But for the present, at least, we have to rely in many, if not in a majority of, diseases on empirical foundations to support our therapeutic measures, content if only they result in the relief of suffering, even if we cannot yet explain exactly how they act.

Thus, for nearly two centuries the profession used cinchona bark, purely empirically, in the treatment of malaria, guided only by the experience of ignorant Peruvian Indians as reported by Jesuit missionaries, and with it saved innumerable lives without at all understanding its action : yet no sane man will claim that its use in this way was unjustified. Finally, when Laveran had demonstrated the real cause of the disease,

investigators like Binz were able to work out the drug's exact mode of action, and our application of it was thereby placed on a rational basis, and its efficacy enormously increased.

Likewise let us hope that we shall some day, as a result of the work of our meteorologists and climatologists, be able to accurately determine why cold or warm air has the effects on pulmonary invalids which years of experience have shown them to possess. Meantime, to those who study tuberculosis these effects are strikingly evident, and the profession will continue to use them in such cases, even if we can only guess at the precise principles which underly their action, and are unable to back them up by proofs sufficiently convincing to satisfy the doubting Thomases in our midst.

The science of meteorology is still very young, the great Maury, who did so much to lay its foundations, being dead not forty years, and it is yet far from being the exact science which it is destined to become; while the closely related study of medical climatology is still younger and less developed, and its problems complicated by the addition of many new factors, which do not enter into the ken of meteorology, so that at present it has to be largely guided by the clinical experience of those who have the opportunity to study the effects of climate, while we hope for a day when these shall be classified and comprehended scientifically.

Thus, when I was asked to write on the effects of heat and cold (which, I take it for granted, refers to hot and cold weather) on pulmonary tuberculosis, I realized that anything I could say would necessarily have to be based on the impressions I have gained from fifteen years' experience in my own case and in those of my patients and would be chiefly a recital of personal impressions which could not be backed up by scientific facts, as I should like. That my views may be coloured by personal bias those who differ with me may

possibly claim, but I trust I have sought the truth long enough to free my mind of such bias as far as one can hope to do so; at least, what I shall say will express my sincere convictions, and I must put the blame for any lack of definiteness in what I write on those who chose a subject as illusive of close analysis as is this.

To those familiar with pulmonary tuberculosis the beneficial effects of cold weather and the relaxing effects of warm weather on patients suffering from this disease are so evident, that it is hard to understand why, for so many years, the general public and the profession should have so feared cold for these cases, and have sought for them warm and balmy climates.

The explanation probably lies in the fact that the diagnosis in those days was made so late in the course of the disease that the cases coming for treatment were practically always advanced, and in these cases very often we find that warm and balmy air, while not so curative, is more grateful and soothing than cold. Thus Madeira, Southern Italy, the isles of the Mediterranean, and similar places, were crowded with advanced consumptives, among whom I would recall Keats and Chopin, the course of whose malady justified the common impression of the incurability of the disease. But, to-day, when we are able to recognize the trouble in its earliest stages, it is different; such cases, with the rarest exceptions, feel relaxed and let down by warm weather and are toned up and helped by cold. They eat more, feel more vigorous, have less fever, and generally progress well; whereas in the summer months they progress slowly or not at all, and the doctor often has difficulty in keeping them stationary, so that a Washington physician a few years ago planned to charter a ship to carry such cases to the Arctic Ocean for the summer. So beneficial are the effects of cold on our tuberculous, indeed, that the physician caring for a sanatorium full of these people learns to wait

impatiently for the advent of autumn days, since with them, or when in springtime belated winter days return, appetite improves, complaints of the table disappear, sleep is sounder and more refreshing, strength increases, and the patients ask for more exercise. Weight curves begin to go up, while temperature curves fall, and so marked is this beneficial effect that even in Asheville, whose altitude and situation on a tableland give an exceptionally cool summer climate, the doctor always looks to the autumn and winter months as those especially beneficial to his patients.

I need not dwell more closely upon these facts, for I do not believe anyone will dispute them, but will simply seek to bring together the scientific evidence which we possess which goes to back up the results of our experience in the matter, acknowledging my indebtedness to Huggard's climatology for the figures quoted.

Metabolism has been shown to be increased, and since increased tissue change is stimulant in its effects upon the economy, we can understand why it is that cold weather acts as a powerful tonic, and why appetite, assimilation, weight, and sense of well-being are increased. Voit has shown that breathing is slowed and deepened, and that CO_2 elimination and oxygen intake are increased. He found that at 4·4° C. (39·9° F.) 210·7 gm. CO_2 were eliminated against 155·1 gr. at 14·3° C. (57·7° F.); while Colosanti found that while at 3·6° C. (38·4° F.) 1856·5 oxygen was absorbed, and 1554·8 CO_2 excreted at 26° C. (78·8° F.), only 1118·6 oxygen was taken up and 1057·4 CO_2 was given off. The fact that we are more resistant to infection in cold weather than in warm is indicated by the experiment of Davaine, who found that the number of anthrax germs needed to produce infection was 2,000 times greater in winter than in summer. That body temperature is reduced by cold weather all who have followed the temperature curves of cases of tuberculosis know, and

Birch has demonstrated that in India the human body temperature ranges distinctly higher than in England; while Brown-Sequard made similar observations on a journey from Mauritius to France.

The beneficial effect of cold days on appetite, assimilation, and weight I have already referred to, and Ranke, during a trip to the Tropics found that the calorific value of food consumed and turned to account was one-third less in the Tropics than in Munich, and that the body weight was also less, while attempts to make up the loss of weight by increase of food only resulted in digestive disturbances; whereas in the Alps he found that "increased consumption of food in colder weather was not attended by subjective or objective disturbances of health, but, on the contrary, by a feeling of increased energy and well-being."

As a result of his work he "considers hot climates dangerous in all cases attended with high heat production," which, of course, would include the tuberculous.

Pulse-rate is also found to be lower in cold weather and blood tension higher, while, as we all learned as small boys, urinary excretion is increased to compensate for a less active skin.

Cold weather also acts as a stimulant to physical effort, which becomes easier and more pleasant, partly, at least, through the stimulating effect upon the nerve terminals in the skin of cold air, as we have all felt when we have had a cool refreshing breeze blow in our tired faces.

It is then, I believe, a matter of common experience, backed up to some degree by scientific observation, that cold weather, if not too extreme, when it can be depressing, tends to do certain things for the human body which chance to be just those which we have found favourable in tuberculosis—*i.e.*, it raises appetite, assimilation, oxygen absorption, weight, vigour, resisting power, and blood-pressure; while it lessens pulse-rate, breath-rate, temperature, and decreases skin activity.

Of course, there are many degrees of cold, and it is hard to say which is the most desirable. Living as I do in a place with a cold and bracing, but not extremely cold, winter climate, and one whose summer is generally cool and never has exhausting heat, I naturally am a believer in the value of moderate cold, while those who live where the winter temperature goes far below zero will prefer that. But this symposium was not planned to give an opportunity to advocate any special climate, and I need not consider the question further here.

The contra-indications to the use of a cold climate in tuberculosis are few but clear. First, in patients with constitutionally low vitality, especially the aged, it can put too great a tax upon the patient's strength, and I have frequently found it necessary to send my old patients, those, let us say, past 65, to warmer climates, though it has rarely been necessary in younger people. A far more important contra-indication is kidney trouble, more especially if it be acute. A slight chronic nephritis, especially if the patient be very carefully clothed to protect the skin, does not demand a change, but the more severe forms of kidney trouble where the action of the skin as a surrogate to weak kidneys is all important, demands that the patient be sent to some warm and balmy climate like Florida, where no tax at all will be placed upon the action of the sweat glands. At times, though not often, I have found chronic rheumatism a contra-indication. Again, a marked tendency to bronchitis of an irritative type necessitates a change to warmer climates, though cold weather usually has a beneficial effect on cough and expectoration after the first few cold days are past.

Laryngeal trouble will at times be rendered worse by cold, though usually only if the cold is accompanied by dampness. As already noted, in the very debilitated or old, with poor resisting power, cold may overtax the vitality and render outdoor life impracticable, and quite often old people thus

find that they must seek warmer climes, especially if there be much arterio-sclerosis.

In a few very excitable and nervous people cold as well as altitude accentuates these qualities, in which case a change is demanded.

The contra-indications to cold are, at the same time, indications for a warm climate, so that I need not dwell upon them here.

However, as I have said, I believe warm climates to be usually less beneficial than cold in this trouble, since their tendency is to relax rather than to tone up, to lower rather than to raise vitality, and to favour rather than to hinder sweating and fever. Moreover, they render exercise more difficult, and decrease appetite and assimilation.

Finally, I would sum up by saying that the essence of the difference between hot and cold weather in their effects upon tuberculosis is that the one is a sedative, the other a tonic and stimulant, and, if this be recalled, their application need not be difficult.

(For discussion of this paper, see p. 99.)

WHY WE TAKE COLD.

BY JOHN O. ROE, M.D.
ROCHESTER, N.Y.

WHILE taking cold is one of the commonest and most familiar phenomena, both as a matter of clinical observation and of personal experience, if I were to ask each individual member of this audience what special influence or influences most frequently produced the disturbance, I doubt if many would give the same answer.

Some might tell us that the immediate effect of cold, acting on the surface of the body, is to excite contraction of the peripheral vessels, by which the blood is driven from the surface into the internal organs and thereby, acting as an irritant, excites congestion and inflammation. Others might tell us that catching cold is due to the removal of heat, to an unusual degree, from the external or internal surface of the body. Others might tell us that the exposure of a limited area of the body to cold, as in the case of draughts of air, will produce a disturbance in the nutritive changes in the tissue. Others might tell us that common colds more frequently result from disturbances of the nutritive processes caused by uneliminated effete products, inducing a condition of auto-toxæmia; while still others might tell us that colds are the direct result of an infection on account of the multiplicity of germs found in the nasal discharges during an attack of acute rhinitis.

It is evident that the theory of mechanical congestion of the internal organs by the action of cold on the surface of the

body is entirely inadequate, because we all know that this form of congestion does not lead to true inflammatory action, since in an attack of acute coryza the Schneiderian membrane is so near the surface of the body that the blood should be driven away from it and not into it.

Those who support the theory that a cold is produced by the disturbances of the nutritive changes due to the exposure of a limited area of the body to a low temperature, as in the case of draughts of air, have likened these nutritive changes, which are under the direct control of the central nervous system, to a chandelier having a number of burners. If two or three are turned off the rest will burn with a correspondingly increased intensity; and so by reason of exposure to conditions that arrest the nutritive changes in one portion of the body, an increased activity takes place in another portion of the body. This disturbance of the nutrition, manifesting itself in the direction of the least resistance, is accordingly most frequently reflected to the nose, the part of the body having the least support, the least protection, and the greatest vascularity of any of the peripheral organs. That colds are frequently excited in this manner no one will deny, but it can be regarded only as an exciting cause, indicating a lowering of the vital resistance by some other cause, which latter condition must be regarded as not only the predisposing cause but the real cause of the whole phenomena.

Coryza, or cold in the head, is, in fact, one of the most frequent manifestations of a general disturbance, which in a very large number of instances is simply a manifestation of a disturbance of the vaso-motor centres, which is caused by a toxic condition due to uneliminated *débris* of unassimilated or effete products, which is very commonly termed "lithæmia." The toxic effect of the lithæmic product on the sympathetic nerve ganglia produces a contraction of the arterioles throughout the body and consequently an increased blood-pressure.

Since, then, the capillaries of the mucous membrane throughout the body receive less support on account of its great vascularity than the capillaries of other parts, as muscles, tendons, skin, and bones, they give way under the increased blood-pressure, with the resulting mucous fluxes from the various surfaces. When the mucous flux, which is Nature's method of relieving the engorgement, has accomplished its purpose and the toxins have had time to become eliminated by the necessary fasting, and when the restoration of the cutaneous circulation has taken place, then these over-distended capillaries return to their normal calibre, the discharge ceases, and the cold or coryza is cured.

Chittenden has shown us most conclusively by his experiments that it is the common practice of people to consume from two to three times the amount of proteids that the system requires to maintain the nitrogenous equilibrium ; he has also shown us that where there is an intake of proteid food there is a corresponding increase of crystalline nitrogenous waste products, such as uric acid and the purin bases, to say nothing of other bodies, less fully known, circulating through the system ; whereas, in case of an excess of the carbohydrates and oleates, we have, as a surplus residue, mainly carbonic acid and water. The latter products are comparatively harmless and easily eliminated, although at the expense of considerable vital energy, while the former is responsible for the great prevalence of renal and hepatic diseases, atheromatous deposits, and the conditions recognized as arteriosclerosis.

Combe, in his admirable work on " Intestinal Autointoxication," describes the " crisis of the elimination of toxic matter " that recurs at frequent intervals, and also calls attention to the fact that the respiratory mucous membrane serves as an excretory channel for certain intestinal poisons. This readily explains the frequency of the induction of anginas and asthma by disturbances of the digestive organs.

Sir James Barr, in a recent address before the British Medical Association on "The Circulation Viewed from the Periphery," emphasizes the important physiological relations existing between the vaso-motor nerves and the peripheral circulation and the effect of toxæmic poisoning of the central ganglia in disturbing the circulatory equilibrium.

Persons with sensitive organizations, weakened by such toxic influences, and whose circulatory balance is but feebly controlled by the vaso-motor nerves, are the ones most easily thrown out of balance and consequently most subject to nasal disturbances. This is particularly the case when the local nerve control of the vascular tissues of the nasal passages is in a continued state of excitement caused by some local disturbance. Therefore, a local disturbance of the nose renders that part correspondingly easily affected by any systemic influence; while the systemic influence, in turn, tends to an increase of the localized diseased condition of the nose, which therefore becomes a veritable vaso-motor index of both local and systemic disturbances.

It is not to be denied that many colds are contracted from chilling of the body, from improper protection, from exposure to draughts, damp air, and the like; but in nearly every instance it will be found that the taking of the cold is due to a depressed condition of the system, a disturbance of the equilibrium of the vascular system, diminishing the resistance of the system to external changes; whereas such exposure would have no effect on the person if he were in a normal condition.

Any cause that may contribute to the lowering of the internal vital resistance, the breaking down of our defences, or weakening of our protective agencies, make us also vulnerable to microbic invasion. Among these may be mentioned exhaustion from fatigue and over-exertion, mental anxiety, lack of sleep, &c. But, as we have already stated, the one that

most frequently conduces to this atonic condition arises from internal derangements, such as gastric, hepatic, and intestinal disturbances recognized as auto-intoxication. To this also should be added the auto-toxic condition, so often caused by the septic absorption from diseased tonsils.

The onset of colds is almost always manifested in an engorgement of the venous sinuses and vessels for a day or more before the systemic manifestation culminates, when, if this timely warning is heeded and active measures instituted, colds can be aborted. A cold, if not thus aborted, frequently becomes infectious by reason of the excellent breeding-ground for germs afforded by the engorged nose, the infection being often attended by such complications as accessory sinus, aural or mastoid suppuration, and in some cases even by cerebral inflammation.

Regarding the bacteriology of common colds, R. W. Allen, of London, has given us the latest, and perhaps the best, exposition of the subject that we have, in which he endeavours to show us by his researches and experimentations that all colds are produced by bacterial agents.

There are four special germs that he found to be peculiar to certain locations, and to produce more or less distinct types of colds; for instance, in the nasal passages, the bacillus of Friedlander seems to be nearly always the exciting cause. In the throat and fauces the *Bacillus septus* is mainly responsible for the throats; while in the larynx and bronchi the *Micrococcus catarrhalis* and the *M. paratetragenus* seem to be responsible for the cough and bronchial irritation. In the severer forms of colds the *M. catarrhalis* may be found in the nose as well as in the parts below, and when present there is greater danger of involvement of the accessory sinuses.

A most interesting part of Allen's studies is in the line of vaccines, by which he shows that in many cases not only is the acute attack very markedly shortened, but a certain degree

of immunity is established. The vaccine that he employs is a culture made of the germs from the patient's own throat or nose, and a dose of from 125 millions to 250 millions of the dead bacilli is injected. The toxin obtained from the patient's own discharges he found much more effective than a stock vaccine of the same germ. In connection with these studies he made careful bacteriological analyses of twenty-three healthy throats. The results, he admits, were both disappointing and confusing, as he found the same germs in both classes; the only difference being that the germs were greatly multiplied in the affected throats.

All studies along this line point to the active part that disease germs play in the production of every form of disease, and also to the fact that we are continually surrounded and invaded by germs, ever ready to attack us when our defences are sufficiently weak to give them a foothold. We must, therefore, determine what are the conditions that so readily render us vulnerable, and which may in reality be regarded as the underlying cause of the difficulty. This, as I have already stated, will most often be found in the condition which is termed auto-toxæmia. This condition of auto-toxæmia is due to putrefactive and fermentative changes that take place largely in the intestinal canal as the result of an intake of food pabulum either of the wrong kind or far in excess of the need of the system.

This superfluous product is speedily elaborated, by the germs invariably present, into toxins which not only cause disease of the different organs but are being carried by the blood to the nerve centres, and by speedily inhibiting the activity of these centres produce various peripheral disturbances. A very commonplace illustration of the activity of this inhibitive process can readily be cited from the frequency with which violent colds in the head follow a very hearty meal. It is this noxious product contained in the blood and

tissues that forms a feeding-ground for disease germs, and renders us susceptible to all sorts of microbic diseases.

It is often the case that most serious maladies begin in what was regarded as a trifling cold and which might have been most readily prevented by proper treatment at its inception. The words of Professor R. Prosser White in this connection are so true that I cannot refrain from quoting them. He says: "I venture to submit that our zeal and interest in a disease should be proportional not to its rarity but to its frequency; and to call trifling a disease which incapacitates members of every class of society oftener and more commonly than any other, and has the reputation of initiating so diverse and numerous ailments, is a travesty of facts. This condition, the bane of the household and the scourge of the community, is allowed to run riot, practically ignored by our leaders, our medical schools, and our text-books, and is a source of inconvenience, if not danger, to the strong, and is often followed by the severest consequences in the old and the young, the feeble and the debilitated—which may be the active factor in over-burdening an already embarrassed heart, setting up the final catarrh in the latter stages of phthisis or multiplying the difficulties and distress of the chronic invalid suffering from bronchitis and emphysema."

Not only are colds often fraught with danger, but frequent repetition of them in the same person should be a warning signal that something is wrong and requires attention; that a diseased condition or derangement, either local or general, is so lowering the vital resistance and weakening our defences that we become vulnerable to microbic attacks from every quarter, and that by timely heed to these warnings we may remove the cause when slight that later on may become our undoing.

"Sublata causa tollitur effectus."

DISCUSSION.

Dr. J. Hilgard Tyndale (of Lincoln, Nebr.): I understood Dr. Kinghorn to say that vaccine therapy has not risen to the dignity of being universally accepted. If cold-air (hygienic) treatment be the accepted method, is it not a fact that more or less permanent arrest by cold-air treatment is mere self-immunization—that is, that it strengthens the defensive powers in the same way that the use of tuberculin does? That, therefore, the use of tuberculin is surely a method to be pursued, at least to be tried, always suited to the individual case. If it is found suitable, then it is to be pursued at the dosage which suits the individual, or, if found unsuitable, to drop it. If cold-air treatment is based on self-immunization, the same basis applies to the use of tuberculin. In my sanatorium in Lincoln, Nebraska, we use tuberculin in all suitable cases. Vaccine therapy is made obligatory under our laws for indigent State consumptives as far as the equipment of the hospital is concerned, but the patient is in nowise compelled to submit to it.

Dr. Thomas W. Harvey (of Orange, N.J.): Having progressed slowly in the treatment of pulmonary diseases by the use of cold air, from tuberculosis through pneumonia, and then on to the cases of prolonged bronchitis, I have found that all cases of pulmonary trouble are improved by putting them into cold air. In other words, many of my cases of bronchitis, after they had got through the beginning of their illness, get more and more cold air, and I find that my patients with bronchitis and a lingering cough are improved by stopping my various cough medicines, hypophosphites, and other things, and taking them outdoors, or putting them up in a bedroom window, or in a room with a lot of windows open; even the little children, three to five years old, I find improve faster and lose their irritating cough with the treatment of cold air, so I have almost come to the conclusion that even the tuberculous cases which have improved most by being outdoors are those with bronchitis.

Dr. Jay Perkins (of Providence, R.I.): I was very much pleased, indeed, with the conservative character of Dr. Kinghorn's paper, also Dr. Minor's paper, but Dr. Kinghorn's particularly. We have heard so much, or the public has heard so much, of the cold-air treatment that it is being carried to extremes. You people in health resorts may not appreciate that as much as those of us who are outside. But I know that in our cities there are a great many people, and physicians, who are carrying the cold-air treatment to extremes, and to the extreme that they do not give their patients the treatment that Dr. Kinghorn has mentioned, and that is, that the patient should be comfortable. Time and again I have seen patients who have slept out of doors, and slept with their windows open, by the direction of the physician in attendance, and they followed directions so conscientiously that they have suffered from the cold, and that extreme exposure has done them more harm than good. I never advise a patient to

sleep out in winter: in the summer I do advise it. In reference to another thing which has just been mentioned. While I am a firm believer in the fresh-air treatment for bronchitis, I wish to differ a little. Another thing to which I object is the putting of cases previously accustomed to warm rooms directly into the cold air in winter. One case which has been under my observation was, after living in warm rooms, given directly the full cold-air treatment in New England in December. As a result, she developed a bronchitis, from which she has not completely recovered in two years. She left the sanatorium in a very bad condition, went back home, and lived under more reasonable conditions, and is gradually getting better. I simply wish to protest against carrying the fresh-air treatment to extremes in winter.

Dr. W. F. R. PHILLIPS (of Washington, D.C.): These papers have brought up some interesting nuts for us to crack; I do not propose to crack any of them myself, for I confess that they are too hard for my teeth, but I would like just to call attention to several things that were brought out, and to ask the members to consider them. In Dr. Minor's paper he spoke of cold being a tonic, and cited an instance where anthrax bacilli were not infective when the temperature was lowered. I wondered whether he recalled also the fact that some animals immune to anthrax bacilli could be made susceptible to infection thereby by making them cold; if I recall correctly, the rat and the pigeon are absolutely immune to anthrax when of normal temperature. So here we have something that it would not do to argue too much from—we have a proposition that it would not do for us to base any very considerable deduction upon.

Another thing Dr. Minor attributed a tonic influence to, that is, he seemed to attribute in his paper some of the improvement noticed in the fresh-air treatment to the effect of cold weather in increasing the excretion of the carbon dioxide and in increasing the assimilation of oxygen: in other words, increasing metabolism. Now Dr. Kinghorn insisted that it was necessary in fever cases to keep them absolutely quiet to conserve their metabolism. Why is increased metabolism brought about by cold weather beneficial and apparently increased metabolism by exercise not beneficial? So it seems to me that we have several things that are problems for us to consider, and if these papers have done nothing else they have brought these problems to our attention.

While Dr. Roe was reading his paper and referred to the popular belief that draughts are the occasion of colds, I was wondering how often we sat in draughts, got wet feet, and other things, and did not get cold; and whether it was not merely an incident in the "catching" of cold that when we got it we began to look back to see what we had done in the previous few days that was a little out of the ordinary, and pick on that little thing as the real thing that gave us the cold.

Dr. HUGH M. KINGHORN (of Saranac Lake, N.Y.): I would like to say a word about vaccine therapy; I am a great believer in the value of

tuberculin treatment. In fact, I use it a great deal together with the cold-air treatment, but what I meant to say in my paper was this: that while tuberculin treatment is of considerable value in the hands of some physicians —that is, while they get good results from it—yet it is not the basis of the treatment of pulmonary tuberculosis. The fresh-air treatment is *the* treatment, and is the basis of treatment to-day for pulmonary tuberculosis. The tuberculin treatment is merely a help, but the fresh-air treatment is *the* treatment.

With regard to keeping the fevered patients at rest and increasing the metabolism, it is with a view to avoiding any exercise whatever. The quieter you can keep them the better are your chances of reducing the fever.

Dr. CHARLES C. BROWNING (of Monrovia, Cal.): It seems to me that in considering climatic conditions heat and cold are only factors in a great complex which makes up the climate. For that reason it is rather difficult to attribute to one factor possibly just the value that it may have in the production of the changes: for instance, the heat where relative humidity is high has rather a different effect from the same degree of heat where the relative humidity is lower; and, conversely, the same is true of cold or the lower degree of heat. There is, I think, a great difference, as has been expressed in Dr. Kinghorn's paper, in regard to the amount of heat or cold suitable for the different patients. Different conditions of the patient and the individuality of different patients are all matters to be taken into consideration. Then again the prolonged degree of heat and cold approaching or above the body heat, and too far below, are factors that I think should be taken into consideration. You take, for instance, patients who are in a section of the country where the days are relatively warm and the nights relatively cool. We find that these patients may go comfortably through the comparatively warm weather; and a certain class of patients do better than they do in the winter. Now it is not all, possibly, a matter of heat and cold, but there are other conditions—the humidity may be relatively high in the cold weather or relatively low in the warm weather, and there are again certain other disturbances which are due to them. One factor in the arid districts, whether tropical or not, is the electric condition. During the time that the barometer is high and the humidity very low you may have rapid movements of air which produce certain disturbances that the people there speak of as electric. This is another factor in the progress of certain patients, and so the consideration of heat and cold can hardly be considered alone. As regards temperature, we all appreciate that high atmospheric temperature causes high bodily temperatures—that is, in our patients that have their heat centres disturbed we have the bodily temperatures running higher; if it becomes cool, we have them ranging less. That, I think, should be taken advantage of as regards metabolism, which has been referred to.

Dr. C. L. MINOR (of Asheville, N.C.): It is a debatable question what

the effect Doubting Thomas had upon the development of Christianity, and I often wonder if the American Climatological Association would have done as well without the stimulus of our doubting Thomas, Dr. Phillips. However, we all admire the honest sincerity of his doubts, although he does sometimes get after us with a sharp stick. It is, of course, true, as I said in my paper, that in the present state of our knowledge we can record only impressions on such a subject, though I trust that the work in meteorology of such men as Dr. Phillips will in fifty or a hundred years give us a working basis and make the subject capable of scientific analysis, as it is not at present. Now, as to Dr. Phillip's objection, I think he is in error, and he will find that in my paper I have said that extreme cold can be, and often is, depressing, though we all know by experience that moderate degrees of cold are tonic and bracing. Had Dr. Davaine run the temperature very much lower, Dr. Phillips would have found results in accordance with his ideas.

As to the question of the increase of metabolism when fever is raised, it is, of course, true that at such a time we wish by rest and other means to lessen metabolism as far as possible, as every added cause of oxidation in the body increases fever and its tissue waste; where, on the contrary, there is little or no fever, a rational increase of metabolism is beneficial, and graduated exercise invaluable. I make this plain to my patients when explaining to them how to exercise by telling them that as long as their deposits in the bank of health are barely sufficient to meet the needs of their mere living, they cannot afford to weaken their credit in that bank by overdrafts as represented by exercise, but that when by rest, food, and quiet, they have built up their credit in the bank, and have a surplus, then they can afford to spend part of that surplus for something more than the mere necessities of living. As regards Dr. Kinghorn's paper, I would wish to refer to his discussion of the question of sleeping out. Every good therapeutic measure is apt at first to be overdone, and this is true, I believe, of sleeping out, which is now spoken of as a *sine quâ non.* My view is that if every moment of time from breakfast until bedtime is spent out-of-doors, then the patient can safely and well afford to sleep in a room, provided it has at least two, and, better, three, windows, especially if he is still febrile and liable to setbacks. When, however, as is apt to be the case when the patient returns home, he must necessarily spend a good part of his time indoors, then I believe it is essential that he sleep out to square up the difference, and to get at night the oxygen he has missed in the day.

A NEGLECTED FOCUS OF TUBERCULOSIS.

By N. S. DAVIS, M.D.
CHICAGO.

It is important that the public awaken to the fact that tuberculosis is especially prevalent in prisons, that it is often acquired in them, and that almost all prisoners are released affected by it to a greater or less extent. They are as a class careless in regard to their health, without resources to combat a chronic disease, and compelled to live among those who pay little or no attention to laws of hygiene, or means whereby disease may be prevented.

Each prisoner who is set free with tuberculosis is sure to become a focus from which the disease will spread among his friends and neighbours, a class of people who can be least easily reached by the agencies now at work to cure and prevent it. Moreover, set at liberty with a chronic disease, which disables him for hard work and necessitates the extra expenses which illness usually entails, the temptation to relapse into the life of a criminal is almost compelling.

The managers of State prisons are alive to this condition and have been doing what they can to correct it. But to do all that should be done they need the support of public opinion, and in many places its initiative. Moreover, city and county jailors, judges, and those having most to do with prisoners, who are detained for a few weeks or a year, have as yet manifested no interest in this subject.

Jailors do not know what should be done to prevent the spread of tuberculosis, and therefore the supervision necessary

for it is not maintained. In the numerous local jails, as a rule, there is no efficient medical examination of prisoners when they are admitted, or care of them afterwards, unless one is apparently severely sick.

It has been known for a long time that of all deaths in penitentiaries about 60 per cent. are due to tuberculosis, while in the population of the world about one in seven deaths is due to the disease, or about 14 per cent. This large mortality in prisons is an index of the greater prevalence of the disease among prisoners and among those who have been discharged or paroled from prison.

While men and women are wards of the State, and while they are completely subject to prescribed discipline, they can be made to live so as to prevent the spread of the disease, and so as to effect a cure. Indeed, among those who are imprisoned for several years, a genuine recovery should often be accomplished instead of a fatality. Public sentiment must demand such medical oversight and care of prisoners as will prevent the infection of prison cells and prisoners such as occurs now, and must demand such care as will insure a cure, or at least an approach to it, in those who are admitted to prison with the disease. I urge this not so much for the sake of the criminals as for the non-criminal population of our cities and country, who may acquire the disease from those who are discharged or paroled. Few people stop to think of the comparatively small number of prisoners who are committed to jail for life or of the large number who are detained for from three months to a year, sometimes awaiting trial, sometimes serving short sentences. Prison officers state that penitentiaries are emptied, or their inmates completely changed, on the average every five years.

It is impossible to tell how many are admitted to our jails with incipient tuberculosis, or who have it in a mild form, for no examination is made of them, and no statistics are available.

This is even true of most State penitentiaries, where much more attention is paid to sanitation. Nor is it possible to obtain statistics which will show how many are discharged having it. All this is due to the fact that the people have not awakened to the need of this knowledge for their own self-protection.

Commonly jails, or at least certain portions of them, are infected. That is, the germs which produce the disease are in the cracks of the floors and walls, or clinging to them, or are in the mattresses. This condition will be readily understood when it is known that in the fine spray ejected by one who coughs, tubercle bacilli are often thrown several feet from the patient and can easily reach floor, walls, and furniture of cells. Tuberculous prisoners who are confined to cells for weeks or months will therefore infect their rooms, even though they are careful to collect and to destroy sputum, but they rarely do even this to protect themselves and others. They are particularly apt to infect new spots in their own lungs by breathing an air impregnated with tubercle bacilli, and, therefore, among them the disease commonly runs a comparatively rapid course. Moreover, the disease-producing material clings to the room and is a cause of tuberculosis in subsequent inhabitants of it. The mattresses in these institutions are usually passed from prisoner to prisoner without even disinfection, and where uniforms are worn they also are often transferred from those discharged to new-comers without disinfection.

All who have visited prisons can appreciate that the cells are necessarily imperfectly ventilated; at least a strong current of air cannot be made to sweep through them and blow out of them dust and germs. Moreover, with rare exceptions sunlight, which is one of the most important natural agents destroying tubercle bacilli, does not penetrate prison cells or if at all only for a few minutes and only the front of the cells. Therefore, the conditions for infecting them and keeping them infected are most perfect.

This fact will make it necessary to devise other methods of confining prisoners unless, as is possible, the early recognition of tuberculosis in them, and the segregation of those affected, may be sufficient to prevent the infection of the cells. Prison cells vary in size from 4 to 8 ft. in width, from 7 to 11 ft. in length, and from 7 to 9 ft. in height. Often when jails and prisons are crowded two men are kept in the smallest of these cells. On week-days prisoners average a stay of fourteen hours in their cells, and on Sundays twenty-one hours. In local jails confinement to cells is even more continuous. The officers of seventy-seven penitentiaries answered a question asked by Dr. J. B. Ransom in regard to the admission of sunlight to the cells as follows: in twenty-two no sunlight reached them; in twenty-four there was partial sunlight; and in twenty-nine direct sunlight part of the day.

Not only do prisoners easily succumb to the disease because they must constantly inhale tubercle bacilli, but also because they do not take active exercise out of doors, which would make them breath deeply and expell the stagnant germ-laden air in their lungs; and because often they are not fed in a way which will maintain their vigour. Moreover, usually depressed nervously by their imprisonment, or subjected to alternating hope and fear during trials, they are in a condition which lessens materially their physical vigour and natural power to resist infection. Indeed, it is the opinion of all those qualified to judge that in the preliminary jail life many become infected, or are rendered physically receptive to the dangers that await them in the prison atmosphere which follows.

It is not chimerical to think that prison management can be changed so as to reduce the incidence of tuberculosis and mortality from it, for Dr. Gibbon, representative of Ireland at the International Prison Congress of 1905, asserted that in his country the mortality from the disease was lower among

prisoners than in the community outside. He ascribed this to good general hygiene and to the constant out-door life which prisoners lead there. Moreover, the successful attempts which are being made in New York and a few other States to solve this tuberculosis problem are interesting in this connection. The methods adopted in New York and Texas will illustrate what is being done. At Clinton, in the Adirondack region, at an elevation of about 1,500 ft., the penitentiary has been used for a number of years for the care of prisoners found tuberculous in the other reformatories of the State. Dr. J. B. Ransom,[1] physician to this prison, has published the following statistics: During a period of two years 461 individuals with tuberculosis were sent to Clinton for special treatment. In most of these persons the disease was in an advanced stage, for only 25 per cent. had it for one year or less. Two hundred and two men of this group of prisoners were discharged—25 apparently cured, 85 with the disease arrested, 8 greatly improved, 76 improved, 8 with no improvement. This illustrates the fact that large numbers of prisoners with the disease are being constantly set free, and also how much can be done to improve their condition. Moreover, and indeed of equal importance, the opportunity is seized to teach them how to live to get well and to prevent the spread of the disease. The good effect of the segregation of prisoners with consumption and their special treatment is shown by the annual mortality at the New York State penitentiaries before and after this plan of management was adopted. For example, formerly at Sing Sing it was 27, and afterwards 7; at Auburn 44, and afterwards 5; at Clinton 10, and it remained 10. The mortality among this class of prisoners at Clinton compares favourably with that at sanatoriums where consumptives in all stages of the disease are treated.

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[1] Document No. 142, 58th Congress of the United States and International Prison Congress, 1905.

In Texas, prisoners suffering with tuberculosis are transferred from all penal institutions, even jails, to a farm managed by the State at Huntsville for their exclusive care. During the first three years of its existence 180 cases were received, but during the third year 50 per cent. less than the previous years, which was doubtless largely due to the segregation of these patients and their removal from the general prison population. Moreover, prior to the adoption of this plan of treatment the mortality from the disease in all the prisons of Texas was 50 per cent., and after three years of segregation and treatment at the prison farm it fell to 24·44 per cent.

Therefore that a great reduction in mortality can be effected, and a very much greater reduction in the production of the disease among prisoners, cannot be doubted.

Moreover, these facts make it evident that a reform in the care of prisoners with tuberculosis is needed. The essentials of this reform are :—

First, laws which make a physical examination of every one arrested and detained in prison for more than one or two days a necessity, and that require a re-examination at least as often as once in six months. Especial attention should be paid to finding early evidence of tuberculosis.

Second, all prisoners having tuberculosis should be segregated, and the usual sanitary precautions taken to prevent a spread of the disease.

Third, cleanliness is a necessity wherever tuberculous patients live; but in such places it means more than is ordinarily meant by the word. Not only must gross visible dirt be removed, but attendants must be taught to properly supervise patients and to insist upon the collection and destruction of sputa and upon cleanness of beds and persons of prisoners. By ventilation, sunlight, soap and water, and occasional disinfection (in itself not as useful as sunshine, ventilation, and soap and water, it is nevertheless a help) of

the quarters used by such prisoners, an approach to asepsis must be maintained such as would be in the best hospitals and sanatoriums.

Fourth, out-door treatment must be provided for all who suffer from the disease in its early stages and in stages of arrest or improvement. This means that quarters must be provided for sleeping out of doors and for spending the day in the open air at rest, or gently exercising or working, as may be suitable for individual cases. Those in whom the disease is far advanced may need care in hospital wards.

It has been urged that this entails too great an expense; but it is not true, as is evident when one remembers that the present lack of care means a long illness, a high mortality, diminished working capacity of large numbers of prisoners, the return into the community of many men who have contracted a chronic disease in prison which makes them incapable of self-support and a source of great danger to those among whom they live. Moreover, while at first the expense would be considerable, in a few years the number of cases to be treated would be comparatively so few that the expense would not equal what it now is. Large cities and populous counties should have their own prison hospitals for the tuberculous. Less populous counties should combine to maintain such an institution, or the state should do it for them.

Fifth, a law should be enacted whereby the trial of those who have tuberculosis should be hastened and unnecessary prison confinement prevented; or, if guilty, they should as soon as possible be transferred to appropriate prison hospitals.

Sixth, prisoners in the advanced stages of tuberculosis should not be pardoned; for when sent home, they endanger the health of their family, friends, and neighbours. Therefore they especially should be cared for appropriately by the State in order to protect the health of the community generally. It is quite customary to pardon or to parole such patients at

the request of relatives. However, the danger incident to this policy becomes at once evident to the thoughtful and well-informed, and the custom should not be continued.

It is time for the people to become conscious of this entirely controllable source of danger to public health, and to demand the reforms in city and county jails, as well as in state prisons and reformatories, necessary for its mitigation or removal.

DISCUSSION.

Dr. CHARLES C. BROWNING (of Monrovia, Cal.): It is in the jails that, I think, the greatest difficulty is experienced. Those of us who have had the privilege of seeing the excellent work that Dr. Bracken referred to in the Minnesota Penitentiary and other places appreciate what can be done ; and while some of the States have excellent provision for the care of the jails, many have not. Taking the States in the Middle West, where the circuit court is the one which tries criminals and meets rarely in the smaller cities, the prisoners are kept waiting for trial three or four months. Prisoners waiting trial cannot be so readily compelled to go out even if this provision is made. There would be a focus of infection for men who have not yet been infected. Then, again, in many of the counties in the other States, and I know in some of the Far West, the county health officer is also jail physician. He holds his position by reason of the governing boards, boards of supervisors, or whatever the body may be, and he frequently receives not more than 50 dollars per month for his services ; he is jail physician, county health officer, &c. He is not expected to do much work, and unfortunately he is at times not very well calculated to do very much work. So in order to reach that class of people it will require a great deal of education of the masses along this particular line. It would be money well expended ; it would be economy in the end, but the present dollar is the one that is going to be most difficult to get.

Dr. E. O. OTIS (of Boston, Mass.): To the list of prison sanatoria which Dr. Davis has mentioned, I would add the one in Massachusetts quite recently established at Rutland, and to which tuberculous prisoners are transferred from the various penitentiaries of the State and treated under similar outdoor conditions as exist in the State sanatorium a short distance away.

Dr. GUY HINSDALE (of Hot Springs, Va.) : I read a paper on this subject before the Society at our meeting in 1905, and gave an account of an inspection of an Eastern State Penitentiary of Philadelphia, where the

segregation of prisoners in solitary confinement has been employed so long.[1] That prison was subject to a very heavy mortality from tuberculosis, amounting to two-thirds of all deaths. After the report which I made to the Pennsylvania Society for the Prevention of Tuberculosis and to the inspectors of the prison, it was very thoroughly overhauled and the cells disinfected, and special attention given to the tuberculous prisoners by way of giving them better air and exercise, and carrying out to some extent the out-door cure. This resulted in great improvement in the mortality-rate of that prison, and under Dr. W. D. Robinson, who was the prison physician for a great many years, the hygienic conditions of the Eastern Penitentiary were immensely improved. Dr. Robinson and the resident physician, Dr. W. W. Leach, took the matter up so vigorously that it gave rise to some controversies; but their work is to be thoroughly commended. I am sorry that Dr. Robinson is not here, as I would have been glad if he could have discussed the paper. It occurs to me that the principle of sending prisoners to the roads on the chain-gang, which is so common in Southern States, is preferable to putting them in solitary confinement as they do in Cherry Hill, in Philadelphia.

Dr. C. L. Minor (Asheville, N.C.): One of the difficulties in meeting this problem which I would wish to dwell upon is that we are handling not merely the poor but the criminal poor, and, in my experience, persons of this class prefer not merely to be dirty, but take a vicious pleasure in soiling and defacing their surroundings, so that you cannot get their co-operation in improving the sanitary condition of prisons. The negro in our Southern jails is very ignorant and very dirty, but rarely malicious; but the scum of Europe, such as Dr. Davis sees in Chicago, can be made to improve their ways only by superior force and by an amount of vigilance which it seems impossible to hope for while, as is the case, politicians run these institutions.

Dr. J. H. Elliott (of Toronto, Canada): The paper brought up two very important points—the treatment of tuberculous prisoners, and the care of prisoners to prevent them becoming infected while serving their sentences. These are two quite different problems, and, unfortunately, the second, which is most important, is closely bound to our present jail system. I think that we all recognize that our present system of confinement in jail is one which makes a prisoner a confirmed criminal. But if we take our prisoners out of the jails in which they are confined, usually at manual labour, and move them out into the country on a farm, we shall not only make men of them, but will markedly lessen this mortality due to infection in the prisons. Following the example of some of the cities and States in the United States, our Provincial Government in Ontario has bought a large farm, where they have a good water supply, beds of gravel and sand, deposits of rock, particularly limestone rock, and the prisoners

[1] *Transactions*, vol. xxi., p. 100.

are already being transported to this farm and are building roads and putting up buildings. I think we should do all we can to foster this in the different States and Provinces, and in this way, indirectly to some extent, and also very directly, we shall lessen this mortality.

Dr. N. S. DAVIS (of Chicago, Ill.): I would like to add a word. I do not feel as pessimistic about this reform as Dr. Minor does. I do think, however, that to reform jail management, which is the most important thing to do—because the penitentiaries in most States are already awakened to the need of reform, and the others will follow—the present method of the care of prisoners must be completely changed. If they are still to be put in small cells which cannot be properly ventilated and cleaned, which are unwholesome in every respect, it is almost impossible to accomplish anything, but I believe this will be changed. I hope that those present will agitate for the needed reform.

STREET DUST AS A FACTOR IN SPREADING DISEASE: METHODS OF REMOVAL.

BY JAMES M. ANDERS, M.D., LL.D.

PHILADELPHIA.

WHILST no one now believes, as did the Greeks and Romans in the earlier centuries of the Christian Era, that devastating epidemics of pestilential diseases are visitations of Providence or angry deities, yet the fact that the majority of human ills result from neglect of certain precautionary, health-fostering measures, which an ever-advancing science has placed at man's disposal, is not fully realized. There is no lack of unanimity of opinion among health officials, sanitarians, and physicians as to the evil consequences to the public health of the filth and dust of our streets. It may be put down as an axiom that cleanliness of our city highways and freedom from street dust are not less important to the municipality than a pure drinking-water supply.

The question of the noxious influences exerted by street dust may be conveniently considered under two heads: (*a*) The effects of the inhalation of non-infectious street dust; and (*b*) street dust as a vehicle for conveying disease germs, or the influence of infective dust.

(*a*) THE EFFECTS OF THE INHALATION OF NON-INFECTIOUS STREET DUST.

The far-reaching ill-effects of floating matter in the air have not been sufficiently emphasized by sanitarians and physicians in the past, and it must be conceded that the

conditions essential to the generation and the diffusion of dust in the atmosphere of our thoroughfares are prevalent to a greater degree at present than at any previous period of time. Again, those charged with the removal of the dust from our streets have failed to cope successfully with the situation in the past.

The composition of the filth and dust ordinarily found in the streets varies decidedly in different cities, and also in different portions of the same city, depending upon the character of the predominant manufacturing establishments which discharge their refuse into the streets, the character of the fuel used, the degree of care exercised by the populace, and, lastly, the nature of the pavement and of the soil in the vicinity. W. Gilman Thompson[1] regards the term street "dirt" as comprising any or all of the following ingredients :—

"(1) The ashes, house sweepings, &c., which are freely blown about from exposed ash-carts and ash-barrels.

"(2) The excrement of horses and dogs voided in the streets, to become dried, pulverized, and distributed by winds and traffic.

"(3) The irritating powdered asphalt ground from the surface of the pavements, and often mixed into a slimy paste with mud, horse-dung, and the petroleum drippings from automobiles.

"(4) Pulverized earth, plaster, iron dust, cement, &c., derived from buildings undergoing construction or demolition, and carried about the streets in loosely constructed wagons.

"(5) The earth from street excavations, usually impregnated with sulphides and other products from leaking gas mains.

"(6) The soot from chimneys, which eventually settles in

[1] *New York Medical Journal*, April 20, 1907.

the streets, and in the winter becomes visible by blackening the snow.

"In addition, as less general filth factors, may be added:—

"(7) The garbage which in the tenement districts is frequently overturned into the street, especially after heavy snow-storms, when its removal is neglected.

"(8) Human excrement, which in the crowded tenement neighbourhoods is often voided by children or adults in blind, dark alleys and ill-lighted streets."

In general, street-dust deposits contain mineral particles which form mechanical irritants; organic matter, both animal and vegetable, of numerous and widely different conditions and character. The organic substance, if allowed to lie in the streets for too long a period, particularly during the warm season, undergoes more or less decomposition, giving rise to other and yet more powerful deleterious products.

The dust found so abundantly in our streets comes principally from two sources: First, that which results from allowing the filth and refuse of the streets to lie undisturbed until it becomes thoroughly desiccated, when it is in a great measure, at least, converted into dust; and, secondly, that which is swept from the soil by wind-currents and traffic, more particularly the automobile. Chimney and smoke-stacks likewise furnish a considerable amount of the dirt deposits of the streets as well as of the dust contained in the air of city streets, particularly in the manufacturing district and along the route of urban railroads.

There is still another constituent of dust which it should be the pride of every community to eliminate, since its ill-consequences are far-reaching: I refer to desiccated human expectoration. Little does the general public understand that in street-spitting we have one of the worst examples of the violation of sanitary laws and decency that could be cited. Sputum harbours various disease germs, particularly tubercle

bacilli and streptococci, and this fact furnishes the chief reason why the dust of our streets (into which the dried sputum enters) is so decidedly prejudicial to the public health. We need not stop here to inquire whether pathogenic implantation is the result of inhalation or ingestion of the tubercle bacillus, but that dust disseminated by air-currents is one of the principal sources of the spread of tuberculosis is an accepted fact.

Following a thaw after snowfalls, uncleaned streets are covered with a slushy mud of varying depth. This germ-laden dirt adheres to clothing and shoes, and thus dragged into the houses, where it dries and becomes diffused through the house-air. The important subject of household dust as a factor in the dissemination of tuberculosis and other inhalation diseases, and the measures indicated in private houses, clubs, theatres, office buildings, schools and churches to meet the demands of hygienic living, however, is one that cannot be discussed here.

Among the important primary conditions caused by the inhalation, more or less constantly, of non-infectious street dust (minute, irritating particles entering into its composition) are naso-pharyngeal irritation, at times leading to frontal sinus disease, pharyngitis, tonsillitis, laryngitis, asthma, and bronchitis. The floating matter in the air may cause a severe conjunctivitis, and in sufferers from organic affections of the heart the irritation produced by the inhalation of street dust into the lungs may call forth pulmonary congestion and œdema. The physical deterioration superinduced by an atmosphere thus polluted is manifested by cough, dyspnœa and other customary symptoms of the pathologic states before mentioned.

It is fair to assume that these conditions may be caused by non-infectious dust, and, more than this, they establish a predisposition to more serious disease of the lungs, such as tuberculosis and the pneumonias. The indirect pathogenic

properties of dusty trades have received startling proof from Scurfield's[1] observations on certain occupations in Sheffield. This writer has shown that the death-rate of "grinders from phthisis is more than six times, and the death-rate from other respiratory diseases nearly three times, that of the average male; while the death-rate of cutlers from phthisis is nearly three times, and from other respiratory diseases nearly four times, that of the average male."

The dangers of non-infectious dust when constantly inhaled in working hours are also shown by an investigation into the causes of death among the Metal Polishers Union of North America.[2] The deaths were with few exceptions from pulmonary tuberculosis, the tubercle bacilli finding a favourable nidus for implantation and growth in the foci of irritation set up by the dust particles. For example, the statistics for 1903 show that 45 metal polishers died, of whom 43 succumbed to some lung trouble; in 1904 there were 38 deaths among them, of which only 3 were due to causes other than pulmonary disease; while in 1905, 70 deaths occurred among the metal polishers, 65 of which were due to some form of lung complaint. Sandwith's[3] careful studies of various industrial diseases have yielded confirmatory results. The above figures afford convincing proof that clean, uncontaminated dust may still prove a potent factor in the etiology of tuberculosis and other pulmonary diseases, although operating in an indirect manner.

Anthracosis due to coal-dust (carbon particles) and the inhalation of vegetable dust set up chronic interstitial inflammation, which predisposes markedly to pulmonary tuberculosis. The mass of dried, pulverized material swept from

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[1] *British Medical Journal*, August, 1908.

[2] Editorial, *Journal of the American Medical Association*, January 26, 1907.

[3] *Clinical Journal*, London, December 2, 1908.

our streets into the atmosphere by the winds, and that whirled up in the form of great clouds of dust by the automobiles, must be inhaled by passers-by with definite, evil consequences. It has been well said that our parks and boulevards have ceased to be breathing places where the poor and middle classes can go for fresh air, and that family outings to outlying parks implies a return to their homes at night choked with dust, instead of being refreshed by them. If we recall the composition of street dust, as given above, principally mineral and vegetable matters, and granting that it is for the most part non-infectious, it is clear that its daily inhalation must nevertheless induce a mechanical irritation, which in turn invites infection with the tubercle bacillus and other pathogenic organisms.

(*b*) Street Dust as a Vehicle for Conveying Disease Germs, or the Influence of Infective Dust.

The extent to which street dust is contaminated with disease-bearing germs must depend largely upon the hygienic precautions exercised by a community. Speaking of the dirt factor in the causation of disease, Thompson[1] observes that it is no exaggeration to state that nine-tenths of the acute inhalation diseases and chronic catarrhal diseases are due chiefly and directly to dirt inhalation. On the other hand, the experience of Hill with the diphtheria bacillus and of Whipple with the typhoid bacillus show these bacteria to be for the most part harmless in dust, unless such dust was very recently infected, since they cannot long withstand light and drying. Occasionally the germs of scarlet fever, pneumonia, and, possibly, whooping-cough, cling to particles of floating matter or flying dust. In the case of the tubercle bacillus, according to Jordan,[2] "sputum that is completely dried so

[1] *Loc. cit.*

[2] "Jordan's Bacteriology," p. 336.

that particles are capable of floating in the air may be infective for eight or ten days, rarely longer."

Unquestionably, the spitting nuisance in our public streets has been responsible for the infection of street dust with tubercle bacilli in the past. The fact is fully appreciated at date of writing that if expectoration on side walks and streets were prohibited, the possibility of street dust becoming infected with tubercle bacilli, pneumococci, the germs of influenza, meningitis, measles, scarlatina, and other pathogenic bacteria, would be reduced to a minimum. The importance of reasonable care of the sputum, if we would avoid contamination of the atmosphere of our homes, sanatoria, street cars, railway coaches, and the like, has been abundantly shown by the experimental studies of Dr. Samuel G. Dixon, Health Commissioner of Pennsylvania; Dr. Irwin H. Hance, for the City of New York, and others.

McCarthy[1] justly incriminates the house-fly as a carrier of infection. Attracted by the vegetable and animal matter found in the dust of the street, he next transports himself, bearing the germs of tuberculosis or pneumonia, to a neighbouring candy or fruit store. Again, he may have visited first a typhoid fever patient, and subsequently been attracted to a near-by fruit store or candy shop.

In this connection reference should be made to the custom of exhibiting for sale food-supplies, as vegetables, fruits, fish, meats, and the like, in places where they are exposed to contamination by flies and street dust. The danger of infection of exposed foods with tubercle bacilli and typhoid bacilli must be great where flies have access to these and also to infected street dirt. Under these circumstances infection *via* the intestinal route with pathogenic organisms,

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[1] "Street Dust as a Factor in the Spread of Disease," *Journal of Outdoor Life*, June, 1908.

such as the *Bacillus typhosus*, tubercle bacillus, and the *Bacillus coli communis* (from horses and other animals, and contained in the dust), would appear to be obvious.

It must be conceded, however, that opportunities for infection, either through inhalation of dust or the ingestion of uncooked foods, has been reduced by the well-enforced laws against spitting on the side walks and by the greater care exercised in the disposal of typhoid dejecta. On the other hand, we must recognize the fact that the dangers of street dust as a vehicle for conveying disease-producing organisms, and also opportunities for inhaling dust, have been infinitely increased since the introduction of the automobile as a means of transportation, for the reason that as a dust-raiser that modern invention stands unique, the fact that the automobile tends to improve the hygienic status of city streets by removing the pathogenic possibilities of the fæces of the horse notwithstanding.

If it be conceded that tuberculous infection is capable of being disseminated by means of air-currents, and also that the dried, pulverized sputum to be found in dust is one of its principal primary sources, as well as methods of extending its ravages, then it is clear that the automobile is profoundly prejudicial to public health, except means be found to successfully prevent dust formation. Finally, it is freely admitted that the indoor air laden with bacilli-containing dust is even more dangerous than that out of doors similarly charged.

Means of Removing Street Dust.—In view of the overwhelming mass of evidence which proves the presence of lurking dangers of street dust, a warfare against this form of air-poisoning until victory is assured would be both timely and of the utmost importance. Perhaps the principal reason why street cleaning is so indifferently and ineffectually carried out in most cities resides in the curious subdivision of work

and responsibility connected therewith ; whereas I feel strongly that it should be controlled solely by the health department of a municipality.

There are feasible and approved modern scientific methods adaptable to local conditions, and these are known to trained sanitarians, sanitary engineers, and physicians, who should constitute the *personnel* of health boards and are best fitted to suggest suitable legislation where the necessity for the enactment of laws may exist. A careful consideration of modern methods of cleaning the streets has led me to the same conclusion as has been reached by H. S. Anders—to wit, that the vacuum or pneumatic method, as practiced in Berlin, gives the best results. It possesses two marked advantages: first, the street dirt is removed without raising any dust ; and, secondly, the process insures a more rapid, satisfactory, and complete cleansing than is obtainable by other methods. Quite apart from administrative efficiency and concentrated responsibility as bearing upon the question of street cleaning, the dust problem, with which we are principally concerned here, must be met.

True, the chronic state of filthy, dust-covered streets tends to maintain and exaggerate under the action of gusty winds, floating matter in the air, and equally true is it that properly cleaned streets would go a long way toward the effectual removal of the atmospheric dust ; but this menace to health would not be entirely overcome so long as pavements having dust-producing properties are used. In many suburban settlements, towns, villages, noted resorts, and public highways, in which it would be impracticable to remove all the street dirt and filth deposits, means to suppress dust must be provided. It is quite within strict truth to affirm that many resorts have been rendered uninhabitable by the dust whirled up in dense clouds by the automobile.

Moreover, the inspiration of dust in the air can be shown

to be sufficiently deleterious in its effects when carried deep into the respiratory tract to make it incumbent on the proper authorities to effect the needed arrangements so far as they are known to remove the atmospheric dust contamination. While the prospects of the removal of dust from the air by appropriate municipal legislation are not particularly encouraging at present writing, still the question of the possible influences of this agency as effecting the prevalence and mortality of pulmonary tuberculosis has been receiving considerable attention at the hands of medical authorities, sanitarians, and sociologists, and it is to be hoped that public sentiment will soon become sufficiently matured to compel the enforcement of suitable measures looking to its removal, and in no way could more substantial progress in urban sanitation be realized.

In Italy, Gaglielminetti has been waging a campaign for years on behalf of the application of crude oil to road-beds; he has adduced convincing evidence to show that the method costs but little more than one cent a square yard, while it renders the roads more resistant and saves repairs, with entire suppression of the dust. On the other hand, tests made of petroleum products to prevent dust on highways by Christiana and Michelis have not proved satisfactory.

Again, it must be recollected that the use of crude oil is inadvisable in streets paved with asphalt, which absorbs this substance. The method of allaying dust in cities by means of street sprinkling is to be advised and encouraged throughout the non-freezing period of each year. The custom in vogue in many American cities of sweeping the streets without previously sprinkling them cannot be too strongly condemned. It must be confessed, however, that the watering of streets in this manner is impracticable in many towns and smaller cities owing to the expense involved. Josias suggests that automobile makers should study to obviate the raising of

dust; "the escapement should not point downward, the tires should be full, and the under part of the frame should be smooth. The ideal would be to have the body egg-shaped, sloping up toward the back."

Among measures advised by a committee appointed by the Stuttgart Medical Society in 1907 to discuss the question of the prevention of dust were to keep the streets carefully cleaned and warning notices in regard to the dangers of dust to be placarded by the Board of Health. Slack[1] well says: "Street sweeping at night, such as is usual in market districts, is to be commended, thus avoiding the stirring up of large quantities of dust during the day when the streets are crowded. Oiling and watering the streets are wise sanitary precautions, and money spent on these means of keeping our streets free from dust is saved a hundred times over in the health of the people."

It is in accordance with the eternal fitness of things that the American Climatological Association should wage a campaign against dust-laden street air, and thus increase its powers of ministering to the welfare of the general public. Such a great task could not be carried out, however, except by the creation of separate commissions for the different large cities and sections of the United States, in which little or no attention has been paid to the question of combating street dust, and these should work through, or in connection with, local health departments.

I would further submit the practical suggestion that a committee of the American Climatological Association be appointed to consider the subject from its hygienic and medical aspects, and to make a report at the next annual meeting. The legitimate scope of this committee should include an appeal to the Mayors of all cities, requesting them

[1] *American Journal of Public Hygiene*, February, 1909, p. 165.

either to appoint special commissions or to urge existing bureaus of health to study the problem with special reference to the good results already obtained in certain of the larger municipalities of this country with a view to overcoming the unhealthful conditions to which an unsuspecting public is now well-nigh constantly subjected.

DISCUSSION.

Dr. J. H. ELLIOTT (of Toronto, Canada): Just a word regarding the use of oil on the streets. The city of Toronto two years ago began the use of oil on the macadam streets, and it will be of interest perhaps to those who are here from cities where there are macadam streets that our city has adopted the use of oil on all the macadam streets, not only because it is more effectual, but because it is cheaper. It is cheaper to oil a macadam road than it is to water it.

Dr. I. H. HANCE (of Lakewood, N.J.): Last year the streets of Lakewood were oiled very largely at a cost not much greater than water. In this connection there was one source of dust that was not mentioned in the paper. It is the handkerchief which is carried around by the ordinary individual; you do not come in contact with it in the street proper, but in street car, and when some one sitting next to you on the street car pulls out a soiled handkerchief and shakes it out, you may be the victim of infection. I think it is a very serious factor in the spreading of contagion. It would almost seem as if one should get up a society for the use of clean handkerchiefs.

TUBERCULOUS PERITONITIS: A PLEA FOR THE TREATMENT OF PERITONEAL TUBERCULOSIS BY HYGIENIC RATHER THAN SURGICAL MEASURES.

BY ARTHUR K. STONE, M.D.
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In regard to the treatment of tuberculous peritonitis, most American operators and many physicians hold practically the following view, which was expressed at a symposium held in New York in 1909:—

"It is a peculiar thing, but it is thoroughly demonstrated that surgical treatment of tubercular peritonitis gives relief in the vast majority of instances by simply opening the abdomen. Nothing further is required. Another point is that the surgeon can remove sometimes a focus of tuberculosis, for instance, in the appendicitis cases, also in tuberculosis of the tubes and uterus; he can remove his focus and then have an enormous advantage over any possible thing he could do for the lungs. Otherwise the cases should go along just about as in the lung cases" [14].

This belief in the miracle of surgery has a firm hold upon very many of the medical profession, and by it the desire to do something decisive is satisfied. But the thoughtful surgeons take a much more conservative ground, and though they may not be willing to subscribe to the extreme position of Borchgrevink, the Swedish surgeon, that all operations are harmful, yet they are more and more reluctant to operate. When, however, there are no distinct indications beyond the presence

of ascitic fluid and the diagnosis of tuberculous peritonitis, the surgeons justify their operations by reference to the statement of Mayo that tuberculous foci can frequently be found and removed, to the great advantage of the patient.

To oppose indiscriminate operation in the face of the work of the past twenty years is an uphill proposition. The burden of proof is in favour of operation. Nevertheless, it is our duty to scan the various facts that have been collected, and see if they are all in accord with the present interpretation of them.

Altogether there has been a great deal of misconception of the subject of tuberculous peritonitis, although it is really not difficult to understand when one considers the pathology of the condition. Cases are either of primary infection of the peritoneum or of extension from distinct tuberculous foci in nearby organs, as the intestines, the tubes, the appendix, or the retroperitoneal lymph nodes.

All cases are probably in a way secondary, for the method of invasion and lodgment of the bacillus of tuberculosis and development in any given individual has not been absolutely settled as yet. So far as we can make out, we find that the disease may be primary in the lungs, on a serous surface, in a bone, or in a joint, or a lymph node, or some special organ, and no other focus be established that can be demonstrated. As the disease progresses other organs are attacked, and by the time death intervenes to relieve the suffering patient many unsuspected foci may be found at the autopsy. That there are not more such foci, and that the lesions are not more extensive and important, is always the wonder when one considers, for example, how, in the pulmonary cases, the lesions are so situated as to make it seem that their most general diffusion would be inevitable.

To the man who would understand the development of tuberculosis in the abdominal organs, Ernest Maylard's [20]

comprehensive book on abdominal tuberculosis is indispensable as a groundwork.

Let us take a brief survey of the subject of tuberculous peritonitis, that we may have a definite foundation on which we shall build our superstructure. Tuberculous peritonitis has been found in the newborn [9], and from this early starting-point on to the octogenarian [3] no age is exempt, though naturally the two decades from 10 to 30 years of age furnish the greatest number of cases.

In the matter of sex, the statistics of the general hospitals are of greater value than either those of autopsy records or reports of operations. The last-named have given a predominance to women of two to one, Mayo four to one, and from these statistics arise the great importance that has been placed on the tubes as a causative factor in the production of tuberculous peritonitis. On the other hand, the autopsy records show men in the proportion of two to one [4] presenting this lesion, while to my mind the true statistics [25] of the general hospitals show men and women in equal proportions. Hence it is impossible for the tubes to be the primary seat in one-half of the cases; and of the women, careful examination at time of operation discloses that the tubes are involved upon their peritoneal surface only in many cases. Still further, when the involvement has seemed so great that the operator has seemed to be justified in their removal, the pathologist has often found no tuberculosis on the mucous surface.

Therefore we must dismiss from our minds the exaggerated importance that has been put upon the tubes as a causal factor in tuberculous peritonitis. The corollary from this is, of course, that ordinarily infected tubes do not need to be removed on sight any more than the omentum or intestines.

But to return to the direct consideration of the pathological condition. All ages and both sexes equally may be attacked by this form of tuberculosis. The invasion may be

most latent [18-7], being found accidentally at operation for hernia or other unrelated conditions. In the light of these not infrequent occurrences one can but wonder whether many of the cases presenting general debility with vague abdominal or intestinal symptoms are not really mild cases of peritoneal infection from the omnipresent bacillus of tuberculosis. At other times the advent is stormy. One says the advent, but if an operation be performed at this time it is usual to find widespread invasion of the peritoneum, and in some cases such thick and well-organized adhesions that it is impossible for the abdominal cavity to be opened—graphic witnesses to the stealth and completeness of the invasion. The patient, however, in one-quarter of the cases [25], while in apparently good health, is taken with sharp abdominal pains, some fever, and in a few days a large effusion of serum may have collected. Or there may be no ascites and the pains may simulate acute appendicitis, obstruction, or salpingitis. When the abdomen is opened tubercles are everywhere found. There are no pathological reports, so far as I know, that show the probable age of the tubercles which have been submitted for examination to the pathologist. The presumption is, however, that they are of comparatively long standing, certainly much older than the date of the sudden appearance of symptoms. It is known also that the tubercles, once formed, remain on the peritoneal surface for a long time after symptoms have ceased [25].

In the persistence of these tubercles we have conditions ready for sudden attacks of abdominal pain and fever, or reaccumulation of fluid, when for any reason the patient gets "run down," "strains himself," or has some slight abdominal injury. These sudden attacks are often perplexing in the extreme to one who is not familiar with the prolonged care of the tuberculous patient [10].

On the other hand, the serous surface may become entirely

free from its tubercles. Gelpke [25] has reported such a case where three operations were done upon the same patient. The second showed fewer tubercles than were observed at the operation done for the relief of the condition, and the third showed the peritoneum entirely free from them. Thus we know that complete restoration of the peritoneal surface can take place.

With the onset of abdominal symptoms it is not unusual to find fluid in one or both pleural cavities. In my experience the left pleura is more often attacked than the right. But the point to be made is that it is not uncommon to have the two serous surfaces below and above the diaphragm attacked at one and the same time. This would point to a common method of infection, and consequently in all such cases would rule out the intact gut, or the tubes and appendix, or other abdominal focus as the primary cause.

In cases when both pleura and peritoneum are simultaneously attacked recurrences may occur either above or below the diaphragm, or the symptoms of activity may persist in one cavity much longer than in the other. As an illustration, I have a patient under my charge, who, six months ago, had fluid in the left chest and then in the abdomen. At present there is hardly a trace of the pleural inflammation left, but, in addition to an infected wound, there is still some fluid to be demonstrated in the abdomen. Another patient, who had an exudate in both sides of the chest and abdomen, developed, a year after all trace of fluid had disappeared, a new exudate in the left chest after a brief essay at working. It is thus to be borne in mind that the serous cavities above and below the diaphragm act in practically the same manner, and physicians well know that many cases of uncomplicated tuberculous pleuritis get well without operative interference.

Abdominal tenderness and pain are apt to persist for a long time after the subsidence of any acute symptoms. Some-

times, as the fluid disappears, ill-defined masses or tumours are found left behind. These are usually coils of intestines bound together by adhesions or knots of omentum. Such masses or tumours may develop without the history of ascites. In severer cases the tubercles may become confluent, forming cheesy masses which break down and cause a purulent, peritonitis. Such cases, where nevertheless the symptoms were only of short duration, have been found on operation [25]. At times adhesions may cause mechanical obstruction, while, on the other hand, most extensive abdominal adhesions may give rise to no symptoms worthy of the name. This has been repeatedly proved at operation or autopsy.

So much for what may be called primary peritoneal tuberculous inflammation. It can come at any age, to men or women equally; its invasion is usually insidious, while attention is in nearly a third of the cases attracted to it by the stormy advent of symptoms. The acute symptoms and the ascites may disappear and the temperature return to normal, but the patient is not yet well, and adhesions may form, tubercles may become confluent and set up new processes or become a focus for the local and direct extension of the disease to the adjacent peritoneum. These persisting inter-abdominal conditions will account for many strange symptoms when the patient is considered apparently well.

There is, however, another class of cases where there is a primary tuberculous infection in the lymph nodes, behind the peritoneum of the cæcum [2], or in the retroperitoneal nodes about the spinal column, or, again, in the tubes or in the gut itself. From these as starting points the peritoneum may be invaded, and at times the tuberculous material is distributed throughout the abdominal cavity. Where there are definite localized symptoms which simulate appendicitis or salpingitis, there is no question but that an operation is indicated to clear up any questionable doubt and remove the

diseased organ or focus if it is found. Again, if there is any question of intestinal obstruction the emergency must be met. On the other hand, there is nothing in the natural history of the development of this condition to point to the need of a laparotomy as a routine measure of treatment. This mode of treatment has spread like wildfire among the operators since the brilliant paper of König's in 1892, and for a time the efficacy of operative treatment was unquestioned, excepting that each operator adopted a special method. One simply emptied the peritoneal cavity, while another wiped it dry, or still a third washed it with antiseptics or injected iodoform; still others let in the air, or the sunlight, or oxygen gas. One let the adhesions alone, another tore them up and hunted for foci, and others removed organs. All this going to show a certain discontent with each and all of the procedures.

The surgeons abandoned drainage after unpleasant experiences with the development of fæcal fistulæ and with the breaking down of infected wounds. Uninfected wounds of tuberculous peritonitis have been found to be less solid than similar scars in non-tuberculous persons, even to the extent of suddenly giving way under slight strain and spilling the intestines, like those of Judas [8].

Many wounds become infected with tuberculous material, and, as it takes time for this infection to develop and make itself felt, patients often have time to be discharged from the hospital with apparently perfectly good scars, only to be discovered a few weeks later with a discharging tuberculous ulceration in the scar. These ulcerations are often very, very slow to heal, months and even years [3] passing before they finally close. In a series of 122 cases done by very excellent surgeons since 1900 I found no less than 30 per cent. either had these infected, ulcerated wounds on leaving the hospital, or they developed shortly after their discharge [25].

This weeping of the wound, as it is sometimes euphemisti-

cally called, may be of distinct value, as it gives ocular demonstration to the patient that he or she is not yet well, and hence one is able to keep them long after they have become restless and are chafing at the restraint which is still necessary to attain the completed cure, or, shall I say, arrest.

It has been my lot to follow during the past three years a number of cases of tuberculous peritonitis for months after their operation for the diffuse type of peritoneal tuberculosis. I could not see how they had been benefited by the operation in any degree. The abdominal tenderness was extreme in some cases. One Italian girl used to weep with the attacks of abdominal pain, which persisted for several months without let up, until, as the result of fresh air, good nursing, quiet and simple food, she gained slowly at first, then more and more rapidly, until she left the hospital to take a course in domestic training, where she would be under supervision and restraint for several months more. Apparently she was in perfect condition, excepting the tuberculous sinus in the wound.

In a similar case a Portuguese woman was kept for over a year and discharged in fine condition, except for the wound with its tuberculous sinus. Here a couple of months at a New Hampshire vacation home finally completed the arrest. The wound closed and has remained so ever since, a period of ten months, the woman having returned to the hard lot of a mill-hand's wife.

These are examples of patients who apparently would have died had they returned to their own environment after the operation. But with protective hygienic treatment extending over a proper space of time an economic cure has been effected.

Many surgeons have recognized the futility of such operations where there is no symptomatic demand. Borchgrevink in 1901 first raised a protesting voice, and since them more

and more surgeons have tended to fall into line with his views. Recently Lund [18], speaking of several unsuspected cases that he had met with in the course of his operating experience, states that he would think it "hardly fair to attribute cure to laparotomy and feel that without laparotomy they might have run their course unsuspected." Professor von Eiselsberg, of Vienna, recently told me that he made less and less number of operations for this condition, and only in those cases where he had to. Another surgeon tells me that in exploratory operations where he discovers tubercles he frequently closes at once, not because he has done a curative operation, but because the incident is closed and tuberculosis better be left alone.

To those who have a chance to meet and diagnose the condition I beg that you will treat it as respectfully as though you had found tuberculous infiltration in the lung-top. The patient is infected with tuberculosis; treat him with the best hygienic surroundings that are possible, above all rest and restraint at first, and then very gradually increasing exercise. If there is ascites present, do not be in a great hurry for it to disappear. It may do so spontaneously. Gelpke and others have raised the question whether its presence may not be of curative value. Great distension needs relief, of course, either with the aspirator or with the aid of the surgeon. Various methods have been recommended to hasten the disappearance of the fluid, but the Röntgen rays cannot be advised as a general method [21-22]. Abdominal applications have their advocates [24], and Alwens [1] thinks that the proper administration of a salt-free diet certainly hastens the disappearance of the fluid. But, whatever method you use, bear in mind that when the turn for the better comes, that the patients begin to improve in a most remarkable manner, as in a case recently reported by Sutherland [15], and is also shown in several of the answers that were received from hospital patients who were sent home to die [25].

There is no reason why the patient should be withheld from any legitimate operation that may come up in the course of the disease. I have found myself in the seemingly anomalous position of urging operation upon a reluctant surgeon.

The disease is tuberculosis, and the prognosis is favourable in the simple, uncomplicated cases of serous involvement. When the lung or other distant organ is also involved the favourable prognosis rapidly diminishes. But in the true cases of tuberculous peritonitis, where no other focus can be demonstrated, the chances of ultimate success under properly conducted hygienic treatment are good. They are not enhanced by surgical intervention without distinct purpose, and any such operation must be treated not as itself curative, but as a step or incident of the "cure."

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DISCUSSION.

Dr. ELLIOTT: There are two questions on which I should like to have information. First, should we, because of the peritoneum being involved, give a diet other than that we would ordinarily give in a case where fever and tuberculosis are present? The other question is, while the surgical treatment is acknowledged to have been successfully employed in the wet cases, have we any figures to show us whether operation is effectual or harmful in the dry cases? I think there is a general belief that in the dry cases surgical interference is harmful.

Dr. W. H. SWAN (of Colorado Springs, Col.): I think this paper is a very timely one, and one of very great value, because I think we should not

take the position, which we all of us have been inclined to, that tubercular peritonitis is necessarily a surgical disease. At the same time I think there are a certain number of cases where there are symptoms of abdominal pain, digestive disturbances that go on for a considerable time, and by-and-by we get an attack of what is pretty definitely appendicitis, and with operation patients gets well of that attack, and they are very much better, and many of them relieved of their abdominal symptoms from that time on, and do very much better with the tuberculosis, which may be coincident. I believe in many of these cases we have a vague, indistinct chronic appendicitis, that we have not been able to recognize, up to a rather more definite attack to call attention to it. We have have had it upon a number of occasions. I have in mind now two or three cases where I have been trying to get the consent to operate for what I suspect to be occurring—that is, chronic—appendicitis where there has not been marked, but vague, abdominal symptoms. If the patient is not doing very well and no apparent reason for it, I wonder if an operation and the removing of the appendix might not be fitting.

Dr. STONE: It seems to me that the mere operation of opening and sewing up again is simply the idea of doing something, something that you do not do in the lung cases you are attending, and your lung cases, taken in time, get well. In the abdominal cases you have the idea, along with the surgeon, that if you do something, you cure your patients. We all see our lung cases go along without marked changes for a long time, and then change quite suddenly for the better; and in some of the abdominal cases that I followed out, patients who were sent home to die, went home and improved: one took up Christian Science, and in three weeks was around and down at the beach. Still another went up into a back county of New York, and had a physician who gave a pill, and the patient immediately got well. And so it has gone in that way. I do not feel that an operation is altogether a perfectly simple thing. I find that one-third of the cases in Massachusetts had ulcers in the wounds afterwards. I found in literature that there were cases where accidents had occurred, as rupture of intestines, &c. How long to wait? That is a question that Dr. Gelpke has considered quite extensively, and he states that he would not remove fluid under six weeks, but just more than that I could not state. In regard to diet, I think there is no special change that should be considered, for in these particular cases that I have been trying to discuss, those with the general involvement of the peritoneum, the intestines are not involved. Hemmeter, in fifty-six autopsies upon patients dying of intestinal tuberculosis, found that in none of them was the peritoneum involved. In a case which I have seen, where the peritoneum became involved by way of the intestine, it was evidently a colon peritonitis that developed, and not a tuberculous one. I cannot state exactly in regard to prognosis in the dry cases, as compared with the wet ones, where there has been operative interference. I noted that in looking up this series of cases at the Massachusetts General Hospital, the

dry cases, operative and non-operative, gave a better set of statistics than the wet ones as to the permanency of cure. This is at variance with most observers. We must consider that a certain number of these dry cases probably were wet at some time ; and that a certain amount of effusion often occurs, and the patients do not record it. I find that in the history a number of times that patients have stated that their bellies have been swollen at some time, but when they come under the observation of the hospital and the doctor the abdominal cavity was perfectly dry.

Dr. E. O. Otis (of Boston, Mass.) : During my service in the Tuberculosis Clinic of the Boston Dispensary, this last winter, a child about 10 years of age was referred to me from the Pediatric Department with the diagnosis of peritoneal tuberculosis. The abdomen was distended, and evidently contained fluid. The diagnosis seemed perfectly clear. The unusual thing about the case was that the child seemed to be in perfect condition so far as her general health was concerned, looking well, with rosy cheeks, and apparently suffering no inconvenience. She was put under good hygienic conditions, kept out of doors, and as time went on the ascitic symptoms gradually disappeared and there was every evidence that the child was making a rapid recovery. I simply mention this case, fresh in my mind, as corroborating what Dr. Stone has said regarding the favourable effects of the hygienic treatment of peritoneal tuberculosis.

Dr. C. L. Minor (of Asheville, N.C.) : In my practice, up to a year or so ago, I have always advised operation in peritoneal tuberculosis, and have usually had very satisfactory results, so that I have a great deal of confidence in the operation. Recently I have had cases in which I have tried a purely hygienic treatment, not trusting to any medicinal measures, and have obtained very satisfactory results. It seems to me the trouble is that as a good many of these cases of operation do not do well, the doctor feels that he must not try so serious a thing, but I believe we owe it to our patients to give them every chance there is, and we have enough records of good results by surgery, so that we feel that, after waiting a time, we are perfectly justified in calling in a surgeon. The danger ought not to be great, and the likelihood of improving the outcome certainly seems to be a fair one. If such cases are not progressing, I think we take a great responsibility in not advising an operation. I refer to simply opening the abdomen and closing it up again without irrigation.

Dr. Barnes (of Wallum Lake, R.I.) : About two years ago we had a patient at Wallum Lake who had frequent attacks of fever, pain, and excessive flowing at the menstrual periods. She seemed no better at the end of a year of sanatorium treatment, but improved rapidly after an operation, in which the tubes were removed. She has worked steadily two years since the operation. The peritoneum was extensively tuberculous. How long should we continue sanatorium treatment before advising operation in such cases ?

THE CONTROL AND TREATMENT OF HYPERTENSION AND ARTERIOSCLEROSIS.

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SYRACUSE, NEW YORK.

THERE are a number of underlying facts which the diagnostician and the therapeutist must continue to bear in mind if he would successfully prevent the results of hypertension and influence the onward march of existing arteriosclerosis. To these facts I wish to allude.

Cardiovascular, more particularly arterial, changes furnish the fundamental morbid processes in the largest number of deaths after the fortieth year.

We are surprised when we examine our clinical material, more particularly that seen in private and consultation practice, to note the recent enormous increase of cardiovascular disease. We are promptly forced to the conclusion when this is compared with hospital statistics that there is an increase of the diseases of the arterial tree, coronaries, the myocardium, and in the nerve supply of the heart the further we are separated from hospital practice.

A careful study of the last 3,200 cases of internal disease seen in private and consultation practice offers food for reflection. These include :—

Arteriosclerosis	276
Endocarditis	135
Angina pectoris	44
Hypertension	67
Mitral obstruction	62
Aortic obstruction, vascular, endocardial (inflammatory)	151
Mitral insufficiency	267
Aortic insufficiency	20
Myocardial degeneration	277
Heart hypertrophy	63
Heart dilatation	59
Senile hearts	25

In a long hand-written report of the lectures of Benjamin Rush, which has recently fallen into my possession, that erudite clinician, of enormous experience and supposed unlimited clinical material, makes the statement that in all of his experience he has seen but one case of angina pectoris; and he mentions the name of another physician practising in Philadelphia who also had seen but one case.

Taking our clinical material into consideration, we are forced to the conclusion that hurry, worry, and excesses are at the bottom of a large majority of our cases in which we have degenerative changes in the cardiovascular system following a long or short period of hypertension.

That heredity plays an important *role* in many of our cases we cannot deny, but we are equally positive that if these patients who are burdened with this unfortunate tendency were cautiously watched and correctly advised by the physician, changes of a degenerative nature in heart and blood-vessels might be longer postponed.

This is particularly true of arteriosclerosis as it affects the coronaries and cerebral blood-vessels. It is not uncommon for us to get the history of three or four cases of coronary disease in one family, and we have family histories in which as many members of a family have died either of cerebral apoplexy or of other brain disease associated with vascular anomalies.

These positive facts teach a valuable lesson. The study of family history is too much neglected. Men who do not keep records, who do not question patients systematically, are very likely to overlook entirely the valuable facts which are gained by a thorough study of the patient's antecedents.

These may seem rather commonplace remarks, but the consultant is so frequently brought face to face with these facts, and understands so thoroughly their great importance, that the opportunity to present them ought not to be neglected.

Modern pathology makes clear beyond peradventure the further fact that there is a physiologic hyperplasia invading the intima during early life. We are forced to consider the separate artery as an organ, therefore a part of the body which has positive functions to perform; that its task is not single but multiple, and that the performance of its daily undisturbed work is attended even during the earliest years of life with a compensatory deposit for the preservation of these organs and the continuity of the circulation. As soon as this physiologic hyperplastic change of the intima because of age, overwork, strain, toxæmia, or from any other causes, is forced into a stage of hypertrophy we have the beginning of arteriosclerosis.

There is a considerable period of hypertension which precedes this profound change in the arterial tree which, however, in the majority of cases is not recognized because of a natural tolerance, and when present there is almost immediate compensation.

If hypertension persists unrelieved, and the factors which continue it remain uncontrolled, organic changes in vital organs are usually present—particularly in heart, kidney, and within the splanchnic area—before the patient presents himself with subjective manifestations.

In other cases, however, but limited changes during the early days of arteriosclerosis are sufficient to cause alarming symptoms, and not infrequently prompt death.

Thus there may be, early in the history of atheroma or arteriosclerosis, only a small lime plaque close to the mouth of a coronary artery, but of sufficient size to choke the heart without a second's warning by covering its mouth.

Hypertension long continued is the leading cause of arterial degeneration. It must be remembered, however, that arteriosclerosis once established, hypertension is not a necessary feature; arteriosclerosis may be present for years with normal, subnormal, or high blood-pressure.

Hypertension upon which we fail to make a favourable impression by rational treatment is already associated with changes in kidney, heart, or within the splanchnic area. We have failed to recognize the enormous extent of the splanchnics and their importance as pathogenic factors in the causation of hypertension and distant cardiovascular disease. The Germans have recently said "Happy is he whose splanchnics are normal and are offering no resistance to the circulation."

To prevent the baneful organic changes following hypertension we must recognize its presence early. Modern methods make this easy. Why not take advantage of these methods as we do of those which unearth kidney changes? To know exactly what resistance the heart has to overcome in the periphery is more important than to recognize the presence of albuminuria.

In considering the subject of hypertension we must remember the great clinical significance of the tightening and relaxation of the arteries of the body, the urgent need of separating the "two factors of the vessel wall and the contained blood."

Why not educate the masses in this direction, that the majority may escape the ravages of final degenerative processes? When the ravages of time force the individual to seek the oculist because of changes in the crystalline lens, and this organ is flattening, and glasses are needed to compensate, or they need to be changed for this retrograde process, he has become a fit subject for blood-pressure study. He is, most likely, in a period in which prophylaxis is demanded, and it will often lead to satisfactory results. When changes are found in distant organs it must be remembered that hypertension or slightly increased blood-pressure may prove an equalizer, compensatory, and ought not to be disturbed.

The sphygmomanometer has proven itself a very valuable adjunct in diagnosis. It is easily and frequently misinterpreted

and abused. No man should reach conclusions from the study of systolic pressure alone; if he would base treatment upon a firm basis he must think clearly, brace himself against one-sided reasoning, and give proper values to all data which are unearthed by the thorough consideration of subjective symptoms and the knowledge gained by physical examination: the sphygmomanometer furnishes but one strong link.

When we find, with evidences of hypertension or already present arteriosclerosis, accentuation of the second aortic sound, we know that "the door is being slammed"—the cusps forming the door—that there is a peripheral obstruction which heart and artery are trying to overcome, and we must act accordingly.

The point which the writer seeks to impress with greatest earnestness in presenting this paper is that if we would prevent arteriosclerosis we must consider the artery an organ with a capacity which is great for work, but which, when abused or overworked, insulted, or poisoned, revolts, and begins to degenerate. When you rob the heart of its sleep, you are damaging that organ and the entire vascular system. Sir Lauder Brunton, in his happy way, has recently said: "The heart practically sleeps more than the brain or the body, but the great distinction between the sleep of the heart and that of the brain is that the sleep is so short at a time." The heart and arteries demand thirteen hours of this sleep daily (this statement surprises those who have not computed the time). When robbed of this repose the periods of rest are shortened; cardiovascular organs are forced to work over-time, more rapidly than before; the foundation for retrograde process is laid. Nature will bear insult a reasonable time; the revolt will come sooner or later with unfailing certainty.

The final break in a large number of cases includes myocardial degeneration with all of its pangs. Hypertension and arteriosclerosis are increased less by the routine work of the

day than by the innumerable outside affairs and engagements which occupy so much of the time of the busy man (particularly the physician) as to cut his rest to a minimum. These workers hold the string taut, the tension under which they work is enormous ; their bearings are worn until at last the string snaps and we are called to repair and reconstruct, often when it is too late.

Hypertension will often lead to a strong suspicion of renal invasion. This is true when associated with hypertrophy of the left ventricle, though albumin be absent from the urine during a long period. The renal arteries may be far advanced in arteriosclerosis without invasion of other kidney structures which, when changed, add casts and albumin to the urine.

From the careful investigation of the diseases of the ductless glands we are convinced that these have a marked influence in producing arterial change, and that in considering the rational treatment of hypertension we are not to divorce ourselves from this possibility.

The production of arteriosclerosis in animals by the injection of adrenalin is proof positive of the correctness of this statement, and must have a decided bearing on the dietetics of hypertension and arteriosclerosis.

The younger the subject the more unfavourably does he react to hypertension and arteriosclerosis. Indeed, we are often justified in speaking of the presence of arteriosclerosis in the aged as a protective process—a true paradox.

If we would successfully control blood-pressure, we must have the hearty co-operation of the patient. He must be willing to surrender himself absolutely to his physician.

Carlyle's definition of genius included infinite attention to detail. Every possible bearing of the life and habits of the individual upon these destructive and degenerative processes must be taken into account by the therapeutist, and this in detail.

Romberg says: "Everyone acquires his arteriosclerosis within the circuit which he has taxed most." Upon this truth we are to act, particularly in attending early to local disturbances, to all intestinal anomalies, including chronic constipation, intestinal indigestion, and the dyspepsias. Even a distant irritation, as a stricture or unrelieved prostatic hypertrophy, may keep up hypertension and lead to arteriosclerosis.

Tobacco—*i.e.*, nicotine—influences blood-pressure very powerfully. Sir Lauder Brunton says:[1] "The rise of blood-pressure is so great that I have never seen it equalled after the injection of any drug, with the exception of suprarenal extract. The rise of pressure is chiefly due to contraction of the arterioles." The ultimate effect is to increase the rapidity of the heart. "When, however, the dose has been sufficiently large to quicken the pulse, no stimulation of the vagus will slow the heart, as its terminal branches in the heart are paralysed by the drug." I quote pp. 168 and 169, Brunton: "Usually, tobacco is employed by smoking, either in the form of cigars or cigarettes, or in a pipe. When used in any one of these forms, it is not pure nicotine which reaches the mouth, but really the products of the dry distillation of tobacco, containing a large quantity of pyridine and picoline bases. Probably nicotine in greater or less quantity is also present. The proportions of the pyridine and the picoline bases in the tobacco smoke vary according to the mode in which it is burnt. In a cigar there is freer access of air, so that much collidine and little pyridine are formed; while in a pipe much more pyridine is produced, and thus stronger tobacco can be smoked in a cigar than in a pipe. So much is this the case that tobacco which in the form of a cigar would produce no disagreeable effect, may cause giddiness

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[1] "Therapeutics of the Circulation." P. Blakiston's Son and Co., Philadelphia, 1908.

and vomiting if smoked in a pipe. The smoke from a pipe or cigar usually passes simply into the mouth, and out again, either through the mouth or the nostrils; but when smoked in a huka or narghileh, the smoke is inhaled into the lungs, and this is frequently done by people also who smoke cigarettes. When a huka or a narghileh is used, the smoke passes through water before being inhaled, and it is thus deprived of most of its poisonous constituents; but this is not so with the smoke of cigarettes, and, as absorption occurs very rapidly from the pulmonary mucous membrane, cigarette smoking is sometimes very injurious. There is another reason, however, why cigarette smoking is frequently more harmful than smoking a pipe or cigar, and it is that cigarettes are small, and can be smoked in a few minutes, so that many more cigarettes than pipes or cigars are consumed in the course of a day, and the total quantity of tobacco used is thus much greater in the form of cigarettes.

"Smoking in moderation does not seem to be injurious to grown-up people, but there appears to be a general consensus of opinion that it is very distinctly harmful to growing lads."

Whatever conclusions we reach concerning the advantages or pleasures derived from tobacco by the healthy individual, it is absolutely interdicted in the presence of hypertension and arteriosclerosis.

Coffee raises blood-pressure because of the caffeine which it holds, and this rise is associated with increased rapidity of the heart's action. It makes the heart irritable, it increases the power of the heart's contractions, it places an extra load upon the kidneys, increasing the urine flow; the solids of the urine are increased by overtaxing its secreting cells. Because of these effects I have for some time held that men beyond fifty who get insufficient exercise or are brain-workers, and children before puberty, cannot with safety to themselves drink coffee. There is something in the coffee bean, besides the caffeine of

which it can be freed, which also acts as a healthful stimulant to brain and other organs which makes it a valuable article of diet.

A patent process is now being used in Germany by which the coffee bean is freed of 90 per cent. of its caffeine. This coffee has been largely used abroad during the past two years, with great satisfaction. There is scarcely a health resort in Germany which is not largely substituting this coffee for the ordinary coffee of commerce.

The taste of the coffee is not materially changed from that of ordinary coffee; the effect, however, upon the heart and blood-vessels is decidedly different. Patients who have never been able to take coffee, whose circulation, particularly the heart, has been unfavourably affected, are able to take it with impunity when freed of its caffeine. During the past year I have given it a fair trial, and am thoroughly convinced of its value and the desirability of using it in all cases of hypertension, arteriosclerosis, and irritable heart; indeed, I believe that it is the ideal coffee for all brain-workers or those of sedentary habits after the age of fifty. Blood-pressure is not increased by its use, nor is there palpitation or annoying systolic force.

The dietetic treatment of hypertension and arteriosclerosis is most important. No abnormalities from which we suffer are more favourably influenced by rational diet than are these conditions. The surcharged artery is always a menace to the individual. When the pabulum which it carries contains an excess of purin bodies, or of irritating substances of any kind, hypertension is increased and arteriosclerosis invited.

We have often been surprised by the routine and empirical methods which are practised in many sanatoria, here and abroad. In some of these, patients with hypertension are treated by what is known as the "flushing method." It is supposed that by giving quarts of water daily the noxious

substances which are floating in the blood are promptly eliminated. No thought is given to the distension of vessels, to the extra work given the heart and kidney which follows this irrational treatment.

Healthy elimination must of course be invited, but not at the loss of heart strength, nor by the over-distension of the artery or the overworking of the kidney. No physician who prefers the use of natural methods decries the influence of pure water, but we must raise our voices against its excessive and empirical use.

In connection with the subject of diet, we are again reminded of the overpowering importance of the study of the individual case. The tolerance of these patients must be tested before full directions can be given. In some we find a low carbohydrate tolerance; in others, purin bodies at once choke the furnace; in still others the digestive organs are so changed as to influence unfavourably the vascular system because of motor insufficiencies, either in the stomach or the intestines. In other cases we find that an ordinary diet is keeping up a hyperacid state which promptly leads to a train of symptoms, including joint changes, final gout, with associated cardiovascular disturbances. Modern methods make it possible for us to clear the horizon without great loss of time, but with great benefit to the patient.

Sufficiently reliable results for practice are obtained from the estimation of the purin bodies by the Walker-Hall apparatus, the uric acid output after the method of Rehmann; while the tests for irdican, ammonia, and other noxious substances are easily made by those who care to study these conditions thoroughly.

Patients with hypertension or arteriosclerosis demand continuous watching; articles of food may be tolerated at one time which, for unknown reasons, exaggerate symptoms and are harmful at other times. If we had our choice of treating

angina pectoris or coronary disease by a single method, I think we would all promptly choose the dietetic. It is surprising to note how much can be accomplished even with advanced sclerosis of the coronaries by a rational diet and proper living without the administration of a single grain of medicine. I know of no disease in which the results are so brilliant, following appropriate diet, as in angina pectoris. Patients who have had repeated severe seizures, who suffer from stenocardia on slight exertion, promptly yield to the diet which gives them just food enough, and not too much, which withholds from them the heavier and more indigestible articles of diet, who take but little meat, never more than once daily, often for days no meat at all, but who are preferably given eggs, fresh fish, easily digestible vegetables, and a limited supply of liquids. These patients demand the minimum of food that will nourish them. Many patients with angina pectoris have promptly lost their lives because of a *single dietetic indiscretion.*

I cannot express to you too forcibly my ideas on this subject in connection with this disease which has robbed us of so many brilliant colleagues.

The question of diet is of the greatest importance in connection with those cases in which there is a strong hereditary tendency.

Agreeable occupation which favours a quiet mental state is of enormous value in the treatment of both hypertension and arteriosclerosis. An exalted and overwrought brain must of necessity be associated with the tear which follows the abuse of that organ. This is at once associated with hypertension ; prolong it, and the associated pathologic conditions will not be long postponed.

I have recently had an example in a lawyer who was engaged in the promotion of an enterprise of enormous proportions, who was without hereditary taint ; in whom the

hurry, worry, and excitement, associated with the launching of this project, promptly led to enormous hypertension, even thickening of arteries, renal invasion, and death in the course of a few months.

These cases are not uncommon, and while the process is not always so rapid or widespread as in the case mentioned, subjective and objective symptoms are not long postponed.

Therefore to the busy brain-worker, whether he has hypertension or not, we are forced to recommend periods of quiet, prolonged rest, change of scene, proper exercise, and temperance in all things. While alcohol may not directly cause arteriosclerosis we are very sure that it does so indirectly, and that productive changes in kidney and other organs consequent upon its use calls upon the cardiovascular system for extra work which finally leads to change of a degenerative character. Individuals react differently to the social glass of wine or liquor. My experience has been that alcohol in any form is injurious in all cases of hypertension and arteriosclerosis, except in a final stage associated with myocardial weakness and broken compensation, to which I shall again refer.

We are all praying for the prolongation of life which is to follow the introducing of the lactic acid bacillus as suggested by Metchnikoff. To those of us who have turned the corner at fifty there is cold comfort in the statement of Metchnikoff, that if our lives are to be prolonged we should have to take advantage of the inhibitory action of the lactic acid bacillus during our early days. However, buttermilk is on trial as never before. Whether by suggestion, or by its inhibitory action on toxin producers in the intestines, it has seemed to make light the hearts of many.

The baneful effect of excessive coitus has not been thoroughly recognized by the profession. At any rate, the "hypertensine" and arteriosclerotic have not been sufficiently

warned against excessive indulgence. In some of our cases abstinence becomes imperative. This is particularly true of those types of vascular disease associated with arterial spasm.

We forget that the heart muscle is not the only true muscle concerned in the circulation of the blood. The skeletal muscles are as much a part of the circulatory system as are the capillaries, veins, or the lymphatics. A healthy circulation demands the assistance which it receives from the heart muscle, the arteries, capillaries, veins, lymphatics, and, not the least important, the skeletal muscles. The circulatory poise is best preserved by attention to all of these separate organs. The healthy stimulation of muscles by massage, proper exercise, with sufficient periods of rest, becomes exceedingly important in the treatment of the conditions which we are considering. Cases in which active exercise is out of the question demand passive movements. The Zander movements are particularly useful. It is unfortunate that we have in this country no such institutions as we find in Germany, rivaling each other, in which it is possible by means of the Zander apparatus to stimulate most muscles of the body, and to do this without danger to the heart or blood-vessels.

The introduction into therapeutics of the various devices perfected by Zander mark an epoch in mechano-therapy which has not been sufficiently appreciated by the profession.

In practice many well-selected cases of hypertension and arteriosclerosis are favourably influenced by warm and hot baths. I have observed the effects of these at Nauheim, Weisbaden, and Karlsbad, and make the statement knowingly that in well-selected cases, though the practice is empirical, the results are often reassuring.

No one health resort has a monopoly of hot carbonated or saline water. On the other hand, we cannot ignore the fact that an environment of success is not to be disregarded. The rest, change of scene, and divorce from active life are

unquestionably factors which make it possible to give the heart, arteries, and other organs that rest which is so much needed in these cases. If the patient will yield, is willing to rest at home, the Nauheim baths with resisted movements are often used to better advantage under his own roof than in the crowded hotels or boarding-houses of the health resort, or in the depressing atmosphere of seriously sick patients.

The discouraging factors with busy men are that they fail to take advantage of our suggestions, do not rest absolutely, continue the supervision of their interests from their homes, which often complicates matters and brings home treatment into disrepute.

Until within the past year I failed to recognize the value of high-frequency currents for the treatment of either hypertension or arteriosclerosis. During the past summer I had abundant occasion to note the effects of this treatment in Karlsbad under the direction of Dr. Buxbaum. Formerly, I attributed the relief of subjective symptoms to the overpowering influence of suggestion. I was promptly convinced, however, that this conclusion was unjust and found that this method of treatment had influenced a large number of cases favourably, that blood-pressure was reduced, and that subjective symptoms were relieved; and in some of the cases the relief continued during a number of months after a sufficient period of treatment.

We are not to conclude that this is a curative agent. It does, however, materially influence blood-pressure, and it does dissipate in many of these cases the annoying subjective symptoms. In advanced arteriosclerosis the blood-pressure is not likely to be reduced. In some the pressure may be raised by the treatment. The cases which react favourably are young subjects with hypertension or those who have symptoms of incipient sclerosis; here there is a lowering of blood-pressure with corresponding improvement in the

general condition. Laquer holds that in these cases the benefit is gradual but, as a rule, permanent. He also holds that where there is cardiac disease without arteriosclerosis good results are obtained by the local application of one electrode over the precordial region. How this agent acts I do not know ; that it is beneficial I am positive. I have seen cases of angina pectoris treated by this method, in which subjective symptoms were held under control during long periods. I do not refer to those cases with the larger attacks but to those in which the sternal pang and oppression were present at some time during each day.

I hear some of you ask what drugs have we to recommend for the relief of the conditions under consideration ? Drugs alone are inadequate to meet the indications offered, but there are drugs which may be given in connection with the methods of treatment already suggested which lead to material benefit and which in incipient cases may lead to cure. The preparations of iodine have for years been the sheet anchor of the therapeutist for the treatment of arterial disease. The great trouble in the average case is that the physician in giving his original prescription for the iodine fails to make clear the urgent need of long-continued treatment with these remedies. If the iodides are to relieve or cure they must be administered during months and even years. Patients who do not tolerate the potassium iodide often benefit by alternating the use of the strontium, rubidium, and sodium salts. I have found that the strontium aud rubidium salts are better borne than the sodium or potassium iodides. The more valuable iodides for the control of symptoms and the influencing of the underlying process are the potassium and sodium salts. It is very easy in the average case to establish tolerance by giving the strontium or rubidium salts first ; finally the sodium salts, then a long-continued period, during which the potassium salt is taken, and as time wears on a return either to the

sodium or rubidium iodide for a short time. The potassium salt, of course, is to be given during the longest possible period. Recently, there have been introduced other preparations which have also seemed to be efficacious, and readily borne. I refer to sajodin, tiodin, and eustenin. The profession has had a fairly satisfactory experience with sajodin. Tiodin is a preparation of iodine and thiosinamin. In occasional cases the tiodin has served very well. Eustenin has lately been introduced and is a combination of sodium theobromate and sodium iodide. It is a whitish, hygroscopic powder, soluble in water. Theobromin has been supposed to increase the blood-flow, and advances the blood-flow through these vessels ; also through the cardiac muscle, the iodides to dilate the vessels and cause a diminution of the viscosity of the blood. The combination of the iodine and theobromin in the form of eustenin has, in some cases in Von Noorden's and Jargie's practice, been satisfactory in relieving subjective symptoms and reducing blood-pressure. A number of years ago Huchard recommended the use of pure theobromin for the relief of sensory symptoms associated with coronary sclerosis. This drug has been given a fair trial ; the majority of those who have used it are willing to confirm Huchard's observations. Theobromin is particularly useful in cases of angina pectoris, also intermittent claudication or painful vascular spasms. I have been in the habit of prescribing not more than ·24 grm. of pure theobromin every morning and night in the average case. It is a purin body and ought not to be used in too large doses. In practice I have found that larger doses are likely to cause annoying headaches. Cases in which with myocardial weakness and coronary sclerosis there are almost continuous sensory symptoms are likely to show improvement from the frequent administration of small doses of the drug; ·12 grm. may be given every two or three hours according to the urgency of the symptoms. The salicylate of theobromin,

in my experience, is not as efficacious as is pure theobromin. Painful processes due to sclerosis, associated with myocardial degeneration, broken compensation, dropsies, in spite of the thickened arteries, frequently show wonderful improvement after the administration of powdered digitalis in ·1 grm. doses with ·6 grm. of the salicylate of theobromin. I have occasionally substituted for the latter ·24 of caffeine sodium salicylate. In these cases it is wise to combine with the digitalis treatment the daily morning administration of one tablespoonful of the saturated solution, either of Rochelle salts or magnesium sulphate in one half gobletful of hot water before breakfast. This will empty the splanchnics and act as a safety valve. In these cases, because of extreme weakness, an occasional glass of claret, Tokay, or even a small dose of whisky, or ethereal stimulant, preferably the ethereal tincture of valerian, will brace the patient and carry him over a critical period until the other remedies already suggested come to his rescue.

Persistent hypertension treated with the diet and methods of living suggested is often favourably influenced by the administration of the Lauder Brunton draught, the modified prescription for which I offer :—

℞	Sodii nitritis	3
	Sodii bicarb., C.P.	32
	Kalii nitratis	32
	Aquæ q.s. ad	132

S. Shake well. Teaspoonful in gobletful of hot water before breakfast.

In rebellious cases of hypertension, usually associated with sclerosis, I give this remedy in the same dosage and in the same way before each meal. Small doses of chloral (·3 grm.) will, in many cases of uncomplicated hypertension, with attention to the digestive system and thorough emptying of the intestinal tract at short intervals by means of salines and the use of alkalies, cause a decided drop of blood-pressure and great relief of associated symptoms.

Pounding, irritable hearts, with hypertension, in which the systolic contraction is unusually strong, the area of cardiac impulse outside the nipple line, with or without vertigo, more or less discomfort referable to the head are, as a rule, relieved by the administration during two or three weeks, three times daily, of from 1 to 1·5 grm. of strontium bromide with from 2 to 4 drops of either tincture veratrum viride or an equal dose of tincture of aconite root. The nitrites, including nitroglycerine, sodium nitrite, and amyl nitrite are most useful in those cases of arteriosclerosis associated with sensory symptoms. For the continuous treatment of hypertension I would prefer the sodium nitrite with theobromin to any of the other vaso-dilators. For the relief of vascular spasm, and attacks of angina, where the physiologic action of the nitrite needs to be prompt, nitroglycerine, erythrotetranitrate, or amyl nitrite are preferable. Small doses of glonoin in extreme cases produce very little effect, only evanescent results. When we are face to face with danger in these cases only large doses of glonoin, preferably in liquid form, and not in tablets, dropped upon the tongue will produce the physiologic effect which is absolutely necessary to prolong life. The lives of patients with threatening death from cardiac spasm or true stenocardia have in my practice on several occasions been prolonged during many years by the administration of nitroglycerine in large doses, sometimes as much as 15 drops in a single dose.

We are not to be held by the rule which interdicts the administration of digitalis in all cases of hypertension, for occasionally in spite of high blood-pressure there are convincing evidences of myocardial weakness without marked fibroid degeneration, in which digitalis does yeoman's work. Such a case I have at present under observation, in which we hesitated to administer digitalis during a long period because of the serious sensory symptoms due to coronary disease, all of which yielded promptly after the use of digitalis, when systolic strength was established.

I am fully agreed that Mackenzie is correct when he makes the statement that "some of the most violent attacks of angina pectoris have occurred in people in whom the exhaustion of the heart was temporary, and the restoration of reserve force resulted in a complete cessation of pain and in permanent recovery." Some of these I have treated with small doses of strychnine and ·3 grm doses of lactate of lime.

In the treatment of both hypertension and arteriosclerosis we receive valuable indications from the consideration of the general condition of our patients and the constitutional treatment accordingly administered. With associated renal complications and anæmia the chlorides are particularly valuable. We must continue to keep before our mental vision the urgent necessity of conveying to the heart and entire system the pabulum which it demands, including an abundance of oxygen.

The life of the Venetian Doge Cornaro, who presented a discourse on "The Art of Living Long," has never ceased to interest us. It is a classic, and should claim your attention.

Cornaro had, I dare say, subjected himself to overwork, and possibly to many other baneful influences, in spite of which he reached his 83rd year. He appreciated the fact that he had made many mistakes, and that he was fast nearing his end. His later experience justified the production of a series of articles, "Wherein the Author details the Method by which he Corrected his Infirm Condition, and Strengthened his Naturally Weak Constitution, and Thenceforth Continued in the Enjoyment of Perfect Health." He lived to be over 100 years old, enjoying to his last day the full possession of his faculties, and many other pleasures which he was quite sure he would not have enjoyed had he disobeyed the laws of Nature. A single quotation is justified :—

"Divine sobriety, pleasing to God, the friend of Nature, the daughter of reason, the sister of virtue, the companion of

temperate living, the loving mother of human life, the true medicine both of soul and body, how much should men praise and thank thee for thy courteous gifts, for that gives them the means of preserving life in health, that blessing which it did not please God we should have a greater in this world, life and existence so naturally prized, so willingly guarded by every living man."

This paragraph contains the essence of therapy, which the thinking physician must apply against hypertension, whatever the cause.

I wish to add that Hag, of Bremen, several years ago brought to the notice of the profession the coffee, which he had treated by a patent process, from which all but about 10 per cent of its caffeine had been eliminated. I have had considerable experience with this caffeine-freed coffee, have watched its effect, and am very positive that it is not followed by the baneful results on the heart which follow the use of the ordinary coffee in too many cases. Blood-pressure is not raised by it. Those who cannot drink coffee at night without being kept awake drink this coffee with impunity. *It is not a substitute for coffee but a true coffee.* Looking at the bean which has been treated by this process one sees no difference at all, and there is very little difference in the taste of the coffee when properly prepared. The dispensers of the coffee in this country, who are chemists, examined the green bean before and after roasting, and attest to the correctness of Hag's contention. This coffee may be used by those who do not bear ordinary coffee well, those who have arteriosclerosis and irritable hearts, and in well-selected cases of nephritis.

ANGINA PECTORIS AND TOBACCO.

BY JUDSON DALAND, M.D., AND W. DUFFIELD ROBINSON, M.D.
PHILADELPHIA.

MEDICAL literature reveals abundant clinical evidence that tobacco plays an important *rôle* in the causation of cardiovascular disease and angina pectoris. In recent years this opinion has been verified by biologic and pathologic data. The observations of Emerson Lee[1] show that smoking by novices causes a rise of 10 to 20 mm. of mercury, with increase in pulse-rate, and later a fall in pressure, usually followed by pallor, nausea, sweating, &c.; moderate smoking by a moderate smoker causes a rise of but 10 mm. of mercury, which rise is gradual, and tends to be maintained during the act of smoking. There is no sudden fall in pressure, and but a slight increase in pulse-rate. Moderate smoking by one accustomed to its excessive use shows no change in blood-pressure or pulse-rate.

Two rabbits inhaled tobacco smoke during twelve to twenty minutes upon alternate days for five months, and were then killed. There was pronounced, extensive fibrosis of the media, invading to a slight extent the intima of the aorta. Dr. Lee thence concludes that arterial disease may result from tobacco smoking. These observations were corroborated by Saltykow.[2]

Adler[3] gave an infusion of tobacco, by the mouth, to

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[1] Lee, *Quarterly Journal of Experimental Physiology*, vol. i., 1908, p. 335.

[2] Saltyhow, *Zentralbl. f. d. ges. Physiol. u. Path. d. Stoffwecks.*, 1908, p. 654.

[3] Preliminary Report in the *Trans. of Assoc. of Amer. Phys.*, vol. xvii., 1902.

several rabbits, which were killed at varying intervals of time. No change was observed until two and a half months had elapsed, when the liver showed an increase in its connective tissue. At four months hepatic cirrhosis was more advanced, and here and there a small artery presented a typical picture of endarteritis nodosa. No changes were observed in the heart nor kidneys.

Favarger[1] and Krehl[2] report a case of dilatation of the heart due to excessive smoking.

Birch-Hirschfeld[3] made a histological study of a case of nicotine amblyopia of seven years' duration, which revealed degeneration of the optic nerve, especially of the papillo-macular bundle, and an increase in the connective tissue.

Uhthoff,[4] Nuel,[5] and de Schweinitz[6] differ as to the primary effects and location of the lesion in the optic nerve and retinæ produced by chronic nicotinism, and also as to whether the process is one of inflammation or degeneration. Other observers have found similar changes in the terminal fibres of the vagus of the heart. It is probable that similar changes occur in the stomach and elsewhere.

Osler,[7] Krehl,[8] Huchard, and others believe that angina

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[1] Favarger, cited from Krehl in American Edition of "Nothnagel's Encyclopædia of Medicine," "Diseases of the Heart," p. 619).

[2] Krehl, American Edition of "Nothnagel's Encyclopædia of Medicine," "Diseases of the Heart," p. 619.

[3] Birch-Hirschfeld, *Arch. f. Ophth.*, liii., 1, 1901.

[4] Uhthoff, *Graefe-Saemisch, Handbuch der Gesamten Augenheilkunde*, 2 Auflage, Teil ii., Band xi., Kapitel xxii.

[5] Nuel, *Arch. d'Ophth.*, October, 1895; March and August, 1896.

[6] De Schweinitz, "The Toxic Amblyopias," Norris and Oliver's "System of Diseases of the Eye," 1900, vol. iv., p. 801.

[7] Osler, Osler's "Modern Medicine," vol. iv.

[8] Krehl, in "Nothnagel's Diseases of the Heart," English Translation, 1908, p. 618.

pectoris may be induced by tobacco, but Sir Lauder Brunton[1] and others regard this pain as anginoid.

It is doubtful that arterial changes from tobacco result from recurring hypertension, but probable that the poison acts directly upon the muscular coat and nerve endings.

CASE 1.—Clergyman, aged 54, no previous illness, except those of childhood, which were mild. No alcohol, syphilis, gonorrhœa, gout, excess of food, nor indigestion. He obtained a fair amount of exercise. From early manhood he smoked to excess, and during the past ten years used tobacco almost constantly, averaging twenty or more cigars and several pipes of tobacco daily. Six months before death, when fatigued by a long walk, he helped to carry a trunk down stairs, when an attack of angina pectoris occurred. These attacks increased in severity and frequency, and were induced by less and less exertion. Three months before death he sought medical advice. The amount of tobacco was gradually reduced and abandoned three weeks before death. Frequent urinalyses were negative. Examination showed extreme arteriosclerosis with left ventricular hypertrophy and dilatation. Dyspnœa was extreme. Two weeks before death, after slowly ascending one flight of stairs, most intense, agonizing pain in precordial and substernal regions occurred. Dyspnœa was most distressing, and death seemed imminent. These attacks occurred during the suceeeding fourteen hours, and also several times daily during the following two weeks. In the last of these attacks death occurred. This case illustrates the causal relationship of tobacco to angina pectoris; no other cause was discoverable.

The following cases were examined, not only by the authors, but also by Dr. R. H. Babcock.

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[1] Brunton, "Effects of Tobacco on the Heart," *Medical Examiner and Practitioner*, New York, May, 1906.

CASE 2. — Male, aged 58, American, married; cigar manufacturer. Family history unimportant; mother died of apoplexy at 68, and the father of dropsy at 58. For several years he suffered severe attacks of angina pectoris. Recently these attacks are less frequent and less severe, usually occurring in the evening, and induced by excitement or the over-use of tobacco. The pain, which is under the midsternum, is cramp-like or aching, and associated with a feeling of constriction or pressure around the chest. The heart is greatly increased in size, due to hypertrophy and dilatation of both ventricles. There exists tri-and bi-cuspid insufficiency and aortic obstruction. All palpable arteries are extremely sclerotic. Dr. Frank Fisher reports that the ophthalmoscopic examination was negative. The urine is normal. There is no evidence of syphilis, gout, nor rheumatism. He over-indulges in food, and has frequent attacks of gastro-intestinal indigestion.

This case of angina pectoris seems to be due to tobacco and over-feeding. As tobacco in excess induces angina, and its withdrawal diminishes the number of attacks, it is evident that tobacco is the chief cause.

CASE 3. — Male, aged 50, cigar manufacturer, unmarried, brother of Case 2. Moderately free use of alcohol and immoderate consumption of food; excessive use of tobacco, partly for business reasons, but largely for pleasure. Exercises insufficiently. Attacks of gastro-intestinal indigestion occur frequently. The pain is precordial, moderate in severity, and usually associated with what he calls "shortness of breath," which is, however, oppression in breathing, or apnœa. These symptoms usually occur while walking rapidly when in a hurry. Occasionally the severity of these symptoms compels him to stop in his walk.

Dr. Charles L. Leonard's X-ray examination showed the heart lying recumbent on the diaphragm, and more horizontal than normal. There was no dilatation of the aorta. Physical

examination showed moderate obesity, chronic myocarditis with hypertrophy and dilatation of the left ventricle; mitral insufficiency from exertion; moderate arteriosclerosis, less than in Case 2. He was advised the ordinary treatment for obesity; pulmonary gymnastics, and 4 oz. of the compound infusion of senna.

The causes of angina in this case are excess of tobacco, moderate excess of alcohol; over-feeding and obesity. As tobacco in excess induces cardiac pain, this is probably the chief cause.

CASE 4.—Male, aged 48, unmarried, brother of Cases 2 and 3, cigar manufacturer, and obliged, from business reasons, to consume from twenty to twenty-five, or even more, cigars daily, in order to determine their quality.

The first attack of cardiac pain occurred three years ago, while carrying a grip sack weighing about 10 lb.; it compelled him to halt and place the grip on the ground. The pain, which he describes as "twisting" in character, occurs in two areas the size of a silver dollar, on each side of the sternum, at the junction of the fifth rib with its cartilage. Occasionally, the pain is substernal, and referred to the lower portion of the gladiolus, or ensiform, associated with contraction of the flexor tendons of the fingers, or may occur in both biceps or wrists, and, at times, compels him to stoop or to sit astride a chair or remain standing. The pain is often intense, accompanied by fear of death, and may disappear quickly after a change of position, after belching, resting, or by the inhalation of nitric of amyl. The duration of the attacks is sometimes two or three minutes; and they may occur in series lasting several hours. Usually, the action of the heart is increased in force and frequency, and palpitation is absent. These attacks may be induced by gastro-intestinal indigestion, intestinal toxæmia, excess of tobacco or food, and excitement; and may awaken him from sleep.

Occasionally, ascending a single flight of stairs may excite an attack. Upon one occasion the pulse rose to 112, the veins became engorged, and the ears cyanotic.

Examination showed arteriosclerosis, marked dilatation and thickening of the walls of the radials, temporals, left carotid and aorta; dilatation of the right ventricle with bicuspid insufficiency. The heart is pushed upward, lying upon the diaphragm with the apex tilted.

Dr. Charles L. Leonard reports that the X-ray examination showed hypertrophy of the right ventricle; that the apex is tilted upward from the diaphragm, and that the position of the heart is more horizontal than normal. The left auricle was dilated and extended backward to the mediastinum; the aorta was dilated. The left ventricle was normal in size.

An obscure nose-and-throat condition, which resisted treatment for many months, disappeared under the influence of mercurial inunctions, arousing the suspicion of syphilis. He was unable to recall a primary sore or any secondary manifestations. The Wassermann and Nuguchi tests were negative, and bichloride of mercury and iodide of sodium produced no appreciable benefit. Nitrite of amyl and nitrite of sodium were beneficial, and also diuretin and strophanthin.

A study of the causes in this case indicates that the long-continued and excessive use of tobacco is the most important one, occuring in one of a neurotic temperament, living a life of excitement, with frequent over-indulgence in food, drink, and venery.

The abuse of tobacco always induced angina pectoris, and its omission caused prompt improvement.

A fourth brother, aged 45, also a cigar manufacturer, with moderate arteriosclerosis, has observed that physical or mental strain, or excitement, or smoking twelve cigars daily, causes slight attacks of cardiac discomfort, which entirely disappears when he lives quietly, avoids excitement, and smokes but three cigars daily.

A sister, aged 52, who has never used tobacco, has no arteriosclerosis nor angina pectoris.

The occurrence of frequent and severe attacks of gastro-intestinal indigestion in the last three cases suggests that chronic tobacco poisoning may exert a similar effect over the alimentary tract to that produced upon the cardiovascular system.

Conclusion.

Long-continued excess of tobacco, by smoking a large number of cigars daily, produces that syndrome known as angina pectoris, by causing degeneration or chronic inflammation of the terminal fibres of the vagus in the heart, and a similar change in the middle coat of arteries.

It is more than probable that other widespread and important pathologic changes are caused by chronic tobacco poisoning, many of which act as contributing factors in the production of angina pectoris.

DISCUSSION.

Dr. Curtin. In my investigation of angina pectoris I inquired in most cases into the habits of the patients and have found other factors which seemed to greatly outweigh that of the excessive use of tobacco. Three years ago I read a paper before this Association in which I gave the brief histories of sixty fatal cases. Of that number, fifteen were in females, all of whom probably did not smoke, and I personally know that eight of the males did not use tobacco, making twenty-three that did not smoke and only one was noted as a great user of tobacco.

Osler notes one out of 206 cases of angina pectoris that used tobacco to excess. He was 23 years of age, and at the time of writing had been well for twenty years. I should say that the excessive use of tobacco was not a primary cause, but when the necessary conditions are present that had caused or were about to cause the attack it might precipitate a paroxysm. The Irishman pulling away at his "dudeen" all day with plug tobacco is not the man to have angina pectoris; but the doctor has it who has not the opportunity to constantly use the weed, for in treating patients and in his

office work he generally abstains from its use. The active energetic business man with an outdoor vocation often smokes all the time, but if he dies of the disease we could better understand that it was the result of his constant nervous strain, for the man who had the same life without tobacco is liable to the same symptoms. I can easily see that any disturbance might precipitate a paroxysm, as in the case of an attack of indigestion, a full stomach from food or drink, intense emotion, &c. So with smoking, it could bring on an attack; but these are not primary or originating causes. Tobacco is rather an aggravating or occasioning cause of paroxysms.

DISCUSSION.

Dr. C. L. MINOR (of Asheville N.C.): Unlike some of my friends who have discussed the question, I am not a smoker, so that I am free of bias in the matter. Doubtless to the smoker these papers would recall the remark of the lady who said that, after all, in this world everything that was enjoyable was either expensive, unhealthy, or wicked. What I wish to note in Dr. Elsner's paper is what he said of Dr. Rush's observations more than a century ago. We doctors have an opportunity to notice how terribly the nerve tension of the American people is increasing, and anyone who will go to a picture gallery and compare the faces of the Americans of 1840 before railroads were everywhere, before the telegraph was known, when the telephone did not keep our nerves on the *qui vive*, when the automobile and the airship were not dreamed of, and when we lived more slowly and more sanely, with those of the present era, when these and many other things are pushing us faster and faster forward, will notice the wonderful difference in the faces produced by these things, and can well believe that there must also be a change in our bodies. There is a calmness and a quietness in the portraits of our grandparents, and, if we are not too young, of our parents, which we do not often see in these days when life is lived at lightning speed, and calmness and meditation are strange. I believe, therefore, that our profession can do much by warning their patients against this over-tension and over-worry, and teaching them that such conditions of mind are bound to react on the body.

JOINT SESSION WITH THE LARYNGOLOGICAL AND OTOLOGICAL SOCIETIES. GENERAL TOPIC FOR DISCUSSION: "VACCINE THERAPY."

The Climatological Association represented by Drs. J. A. Miller, H. M. King, and Walter A. Griffin;

The Otological Society by Drs. H. C. Reik and B. A. Randall; and

The Laryngological Association by Drs. H. S. Birkett, C. G. Coakley, and F. C. Cobb.

THE TUBERCULIN TREATMENT OF PULMONARY TUBERCULOSIS IN OFFICE AND DISPENSARY PRACTICE.

BY JAMES ALEXANDER MILLER, A.M., M.D.
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PRESENT medical opinion in regard to the use of tuberculin may be roughly divided into three categories.

In the first are those who are still influenced by the early antipathy to tuberculin, caused by its misuse and fostered by the denunciation of Virchow. These men believe tuberculin to be too injurious an agent for medical use.

In the second group are those who see in its striking and easily demonstrated effects on the tuberculous individual a short cut to diagnosis and treatment, which will spare the necessity for the more laborious and painstaking methods.

And, lastly, we have those who believe strongly in the value of tuberculin, but have come to realize its limitations, so that it is welcomed simply as one more valuable aid to be used in careful conjunction with all other known and accepted methods for the diagnosis and treatment of tuberculosis.

Almost without exception, those who have had extensive

practical experience with tuberculin for treatment are now included in this last category. In consequence, tuberculin is now being used very widely, but the majority of reports have come from sanatoria, so that the value of this method of treatment in office and dispensary practice is not yet generally appreciated.

Undoubtedly it is preferable to have cases of pulmonary tuberculosis under strict supervision, and it is advisable for anyone to gain his first experience with tuberculin from patients in institutions where they can be carefully watched and studied. There are, however, no insurmountable obstacles to the employment of tuberculin therapy in the class of ambulatory patients here under consideration. This class constitutes by far the vast majority of all cases of tuberculosis, and, consequently, any method of treatment which can be advantageously applied to these cases has immediately a very wide sphere of usefulness.

Already good results have been reported with dispensary patients. Among others, notably by Hammer, Denys, and Raw in Europe, and in this country by Hawes and Floyd in Boston, and Hamman and Wolman in Baltimore. Their experience agrees with our own in New York—that the results of tuberculin treatment are most encouraging, and that they can be obtained in a dispensary as well as in a sanatorium.

Rationale of Tuberculin Therapeutics.—It has been conclusively demonstrated that tuberculin does not produce an immunity to tuberculosis, either clinically or experimentally. The claim for its specific action in tuberculosis is based upon the following clinical phenomena :—

(1) It produces a specific hyperæmia at the site of the lesion which has distinct therapeutic value by stimulating both local resistance and the production of antibodies.

(2) It causes a specific response in some of the vital reactions of the body which are closely associated with true immunity—*e.g.*, opsonins, agglutins, precipitins.

(3) It establishes a toxin tolerance which is also perhaps a real toxic immunity.

Upon the first phenomenon of local reaction Koch based his original ideas of treatment, but, by large dosage, carried it to such an extreme that great harm resulted, and the method soon fell into deserved disrepute. With the small doses now given, this factor of slight local reaction is undoubtedly very important.

Wright, in his work, has made use of the second phenomenon—*i.e.*, change in the opsonic index as a basis of treatment. In pulmonary tuberculosis this has proven unreliable and unsatisfactory.

The third phenomenon of toxic tolerance is the one upon which the so-called "clinical method" of treatment has been based, and it is this method with minor variations which is at present generally employed.

The Method of Toxin Tolerance.—For many years a few far-sighted clinicians have recognized that in Koch's discredited cure there lurked a valuable adjunct to the treatment of tuberculosis. The careful clinical observations of these men, Trudeau, Möller, Petruschky, Loewenstein, Denys, Spengler, and others, gradually developed what may be designated the method of "tuberculin tolerance."

This method may be defined as the gradual habituation of a patient to the hypodermic administration of increasing doses of tuberculin, beginning with an amount easily tolerated, and proceeding over a long period of time to large doses, without the production of any marked constitutional reactions.

Opinions differ concerning minor features of this method, as to the size of the beginning and final doses, the rapidity of increase, the duration and continuity of treatment, the significance of mild reactions, &c., but in the essential principles there is now a general agreement, and in the other details observers are gradually coming nearer to meeting upon common ground.

Selection of Tuberculin.—The active principle, the method of action, and the efficacy of all the various preparations of tuberculin are practically the same. Koch's old tuberculin (O.T.) is the standard, and is probably quite as efficient as any of its modifications; bacillus emulsion (B.E.) and Koch's new tuberculin (T.R.) are theoretically better vaccines. They are, however, apt to produce unexpected reactions, and clinically produce no better results than the filtered preparations. Bouillon Filtre (B.F.), theoretically, is preferable, because unaltered by heat. Practically, its only advantage appears to be its somewhat easier tolerance in hypersensitive individuals.

The claim that bovine tuberculin is preferable in many cases rests upon insufficient evidence, and the fact that the human type of bacillus is recovered from almost all cases of pulmonary tuberculosis in adults, deprives the arguments raised in its favour of much weight in the cases which are here considered.

There are many other modifications of tuberculin, none of which have become widely used, nor have they shown any superiority to the few already mentioned.

Selection of Cases.—Tuberculin should, as a rule, be used for treatment in pulmonary tuberculosis only in such cases which have no temperature and are in good physical condition.

Inasmuch as success depends upon a reaction of the tissues of the body to the stimulus of the toxin introduced, if these tissues are not capable of such response, as in very acutely active or very far-advanced cases, harm rather than good is usually the result.

In certain selected cases under strict supervision, and after a large experience has been acquired, febrile cases may sometimes be treated to advantage, but they are exceptional. Such cases should, of course, never be treated in office or dispensary practice.

Incipient and moderately advanced cases, of course, do best under this as any other known method of treatment; nevertheless, the most striking favourable results are obtained in cases of long standing which have drifted along into chronic invalidism, with perhaps only occasional evidences of active symptoms, but with a slowly progressive extension of the lesion and increasing constitutional impairment. The cases with which I have had personally to do are largely of this class.

Incipient cases I have always sent to sanatoria or health resorts if possible, and I have never felt justified in advising any early favourable cases for whom sanatorium treatment was available to remain in New York in order that they might receive the tuberculin treatment. When such incipient cases do stay in town for one reason or another, they of course do better under tuberculin than do the more advanced cases under similar conditions.

On the other hand, it is interesting to note that not a few of my cases have been those who have tried climatic treatment for years without arrest of their disease, and having come home to gradually drift downward to the apparently inevitable final result, have made remarkable improvement under the use of tuberculin, and in many cases have been able to resume their ordinary occupations.

Accessory Methods of Treatment.—The ordinary methods of the hygienic-dietetic treatment of the disease must never be neglected in cases treated with tuberculin.

In dispensary and office practice in a large city this is by no means easy, and this portion of the treatment is very seldom as satisfactory or complete as could be desired. For this reason, however, the effect of the tuberculin as distinguished from that of the environment can be more clearly determined than is possible in sanatoria.

Almost invariably it is my custom to give each patient

before beginning the tuberculin a preliminary course of absolute rest, combined with as much good air and good food as is feasible. Sometimes this has been in the country near New York, but usually in the city itself. This preliminary rest is important in order to enhance the general resisting powers of the patient and thus favour a proper response to the process of active immunization.

During the earlier part of the treatment also rest is still a large factor, but gradually more exercise is allowed, according to the individual indications, and not a few of my cases have worked regularly at their usual occupations during the greater portion of the course. Any unusual exertion or strain is prohibited for twenty-four hours after each injection, but absolute rest at these times is not essential.

Private patients have usually lived in the suburbs, where conditions are more conducive to the open-air life, and have come in for treatment twice a week. No harm has resulted from these trips, and on account of their better surroundings these patients have as a rule done better than those in the dispensary. In a few instances local physicians have given the injections under my general supervision, the patient reporting to me only once in every two weeks or thereabouts.

Some private patients and all of those in the dispensary have lived in New York continuously. For the latter, the visiting nurse, aided when necessary by charitable societies, has done as much as possible to rearrange the tenement home in the best interests of the patient. Nothing more has been done, however, for the tuberculin-treated patients than for the other patients under the care of the dispensary.

The day camp has been of considerable benefit by affording favourable conditions during the day for not a few of the dispensary patients. A few of them have also attended the night camp, thus having opportunity for sleeping in the open air.

Very few drugs have been given, and these only occasionally, for the relief of special symptoms.

Technique.—The injections have been given as a general rule twice weekly until high doses are reached, when the interval is lengthened. They are given subcutaneously in the interscapular region with the ordinary precautions for a hypodermic injection. No cases of infection have occurred.

The dilutions are made with $\frac{1}{4}$ per cent. carbolic solution, and are renewed at least every ten days. It is a distinct advantage for the administrator to make his own dilutions. It is a comparatively simple procedure, and familiarity with it gives one a better knowledge of the agent that he is using. It also fixes responsibility for exact accuracy and avoids needless delay.

The patient records his temperature and pulse three times daily, and is warned of the symptoms of reaction for which he must watch. In some cases tuberculin record books have been used, but often the catalogue of possibilities spread before him has rendered the patient too introspective, and in dispensary patients few have the necessary intelligence for accurate observation, so that the use of these books has been the exception rather than the rule.

In these cases even more care must be taken to note the effects of the previous injection than in cases under close supervision. Careful questioning of the patient, together with the temperature record and examination of the site of injection have given us satisfactory information, but in case of doubt no chances of reaction are ever taken, and the dose is either repeated or omitted altogether.

Dosage.—The clinical method of gaining tuberculin tolerance without constitutional reaction is the usual one employed, and the only one with which I have had much practical experience.

Two different schemes of dosage are widely employed.

The first, advocated by Möller, Loewenstein, and others in Germany, begins with $\frac{1}{100}$ to $\frac{1}{10}$ mg. of O.T. or B.F. and increases rapidly, often by doubling the dose, very soon reaching high dosage. The second, recommended by Trudeau, Denys, and Sahli, begins with $\frac{1}{1000}$ to $\frac{1}{10000}$ mg., and proceeds much more slowly by fractional increases on a modified decimal system.

For a general scheme, the latter is undoubtedly the better and safer method. Reactions very seldom occur and no harm can be done, while the results are very satisfactory. By the first method reactions occur frequently, and in unskilled hands intolerance to tuberculin can easily result.

Nevertheless, it is our experience that cases which take kindly to this higher and more rapid dosage improve more rapidly and perceptibly than do similiar cases by the other method. Moreover, by the lower scheme some cases appear to be unaffected, as though the dosage was too far below their degree of tolerance. Consequently, as soon as experience with tuberculin has been gained, advantage results from careful individualization in the dosage for each patient, the object being to keep very close to the limit of tolerance and still not cause reactions.

In a general way, the Trudeau-Denys scheme may be regarded as the lowest to be used, and the Möller-Loewenstein scheme as the highest. Best results are obtained by skilful individual variation of dosage between these two extremes.

The maximum end dose to be attained is also a question of individual requirement. In a general way, 1·0 gr. may be considered the maximum dose ever to be employed, but in many cases this can never be reached, because of tuberculin intolerance. In these cases quite as good clinical results ensue from a very slow progression of dosage up to 10 mg., 1 mg., or even $\frac{1}{10}$ mg., as the case may be.

White recommends a method of determining the proper dose for each individual by a determination of the amount of tuberculin required to give a cutaneous reaction by the von Pirquet method. I have had no experience with this method, which is ingenious, but appears open to sources of error from individual variations in the absorption of tuberculin through a skin abrasion.

In using B.E., it has become my custom to reckon the dosage by volume just as is done in the filtered preparations, 1 c.c. of the emulsion being considered equal to 1·0 gr. of O.T. or B.F., and upon this basis the same dosage as that already described for these latter preparations being employed.

The amount of solid substance can, of course, be readily reckoned from this, but I am convinced that the usual beginning dose of $\frac{1}{10000}$ to $\frac{1}{1000}$ mg. of solid substance is much too high and partly accounts for the more frequent reactions caused by this preparation. By the volumetric method the beginning dose is only $\frac{1}{200000}$ mg. of solid substance.

Guides to Dosage.—The underlying principle should always be to avoid every constitutional reaction, however slight, to the increasing doses of tuberculin.

Too great emphasis cannot be placed upon the importance of watching closely for slight evidences of intolerance to tuberculin, as shown by malaise, loss of appetite, headache, moderate loss of weight, &c., even when no febrile reaction has been produced.

Increased cough and expectoration, pains in the chest, and even slight hæmoptyses are evidences of a focal reaction in the lungs, and must necessarily be considered carefully. I do not feel, however, that such reactions, if slight, show the same tendency to intolerance as do the slight constitutional reactions, and it has often seemed as though a very slight focal reaction was beneficial. We are here treading, however, on very

delicate ground, and the exercise of additional care is necessary in these cases for, of course, any considerable focal reaction is not only undesirable but may even be dangerous.

The local reaction at the point of injection should also be carefully considered, there usually being no disturbance beyond a slight sensitiveness for a few hours. The appearance of local pain, redness, or swelling is an excellent indication of an approach to the limit of tolerance, and should be so considered in estimating the proper progress of dosage.

Patients with any tendency to constitutional reaction are given a rest from the treatment for several days or more, and then either the same dose repeated, or some fraction even as far down as one-tenth of the preceding dose given, depending entirely upon the severity and the duration of the reaction that has been produced.

In a general way a mild constitutional reaction protracted over several days is more serious than a sharper reaction, which quickly disappears. A new injection should never be given until all signs of reaction have been absent for several days.

The opsonic index as a guide to dosage, as advocated by Wright, is largely used in England. This is the most scientific guide to dosage that has been proposed, but practically it has proved unreliable, especially so in pulmonary tuberculosis, and its use has been generally discarded.

Other proposed guides, such as the agglutination test and the differential neutrophile blood count of Arneth, have not proved to be of value.

Duration of Treatment.—No results of any permanent value can be obtained unless the tuberculin is continued for a long time, at least six months. Very little beneficial effect is noted before two or three months, and this is not permanent unless followed up.

The desirable length of treatment will probably average

eight or nine months, and not a few individual cases require a year or even eighteen months.

This is a great disadvantage, as it is always difficult and often impossible, to keep patients under regular observation so long. This is particularly true in the patients who do well and consequently do not realize the importance of further treatment, and in the dispensary cases, even though the visiting nurses do their best to follow up the patients in their homes.

Repeated Courses.—In many cases, especially those of the chronic advanced type, more than one course of tuberculin treatment is advisable.

The secondary courses are shorter than the first, and the doses increased much more rapidly.

The necessity for a second course is determined largely by the clinical symptoms.

A return of the evidences of toxæmia is the most valuable indication. A return of response to the cutaneous test may also be of value when considered in conjunction with the clinical evidence.

Results.—The chief beneficial results from the use of tuberculin are the disappearance of toxic symptoms and the greater permanency of the regained good health.

There is also some evidence to show that tubercle bacilli disappear from the sputum more frequently in tuberculin treated cases, but the direct influence upon the pulmonary lesions as indicated by physical signs is not striking, indeed is often not appreciable.

In advanced cases the improved conditions are most marked, and to note the frequent return to normal methods of living in patients who have been chronic invalids for years is a most gratifying experience.

The stability of results is especially striking in dispensary patients. In spite of untoward environment, relapses are comparatively infrequent after tuberculin treatment and the

ability to withstand the stress and strain of life is often very surprising.

In a chronic disease dependent upon so many varying factors, the value of statistics is open to question. Nevertheless, enough statistical evidence concerning tuberculin has now accumulated to lend substantial support to clinical impressions of the value of this method of treatment in out-patient practice.

Denys, in 442 cases of all stages, the majority of which were extramural patients, reports an apparent cure in 56 per cent. and an improvement in 71 per cent.

Hammer, without giving any figures, states that he uses tuberculin for treatment at the Heidelberg Medical Polytechnic on practically all patients, most of whom belong to the labouring classes, and that his results are excellent, and he advises its general use in dispensary practice.

Hawes and Floyd, in forty-six cases of pulmonary tuberculosis treated in the dispensary, report thirty-two arrested, seven improved, and seven unimproved. Compared with patients under similar conditions not treated with tuberculin, they state the difference in results obtained were that the tuberculin-treated cases after arrest did not relapse as soon as the untreated cases.

Hamman and Wolman, in fifty-seven dispensary cases of pulmonary tuberculosis of all stages, treated with tuberculin at least ninety days, found ten apparently cured, sixteen arrested, twelve improved, and nineteen progressive.

In my own experience in New York, out of 212 cases treated with tuberculin in office and dispensary practice, only seventy continued under treatment ninety days or more. In these seventy cases the following results were obtained :—

Apparently cured	16	22·8 per cent.	51·4 per cent.
Arrested	20	28·6 ,,	
Improved	16	22·8 ,,	
Progressive	18	25·7 ,,	

PRESENT CONDITION.

Well in active life	28	40·0 per cent.	58·5 per cent.
Feel well, still under treatment ...	13	8·5 ,,	
Not doing well	6	8·5 ,,	
Dead	10	14·3 ,,	
Untraced	13	18·5 ,,	

STAGE OF DISEASE.

Incipient	9	12·8 per cent.	
Moderately advanced	42	60·0 ,,	87·2 per cent.
Far advanced	19	27·2 ,,	

DURATION OF TREATMENT.

5 months at least	49
9 ,, ,, ...	15
12 ,, ,, ...	6
Patients working while under treatment	8

RELATION OF STAGE TO RESULTS.

	Apparently cured	Arrested	Improved	Progressive	Total
Incipient	7	1	1	0	9
Moderately advanced ...	8	16	12	6	42
Far advanced	1	3	3	12	19
	16	20	16	18	70

Particular attention is called to the fact that although 87·2 per cent. were advanced or far-advanced cases, 51·4 per cent. were apparently cured or arrested. That eight patients worked regularly during the course of treatment, and that although these cases here reported have been treated over a period of five years, yet at the present time 58·5 per cent. are known to be well, and 40 per cent. having finished their treatment are now well and leading active lives.

Summary.—The present position of tuberculin therapy may be summarized as follows :—

(1) Tuberculin is a valuable addition to our means of treating pulmonary tuberculosis, its effects being best evidenced by a greater permanence of good results, a larger proportion of cases which lose bacilli from their sputum, and the relief from toxic symptoms, especially in chronic advanced cases.

(2) Tuberculin can do no harm when given carefully in proper dosage.

(3) No one of the more ordinary preparations of tuberculin possesses any material advantage over the others.

(4) The so-called clinical method is the most practicable guide for the administration of tuberculin in pulmonary tuberculosis, and the aim should be to produce no general reactions.

(5) The time element in treatment is more important than the absolute dosage, the latter varying with every case, and the former being never less than six and often more than eighteen months.

(6) With unimportant modifications this method of treatment is quite as applicable to dispensary and office patients as to those in sanatoria.

VACCINE THERAPY IN TUBERCULOSIS IN INSTITUTIONAL PRACTICE.

BY HERBERT MAXON KING, M.D.

LOOMIS SANATORIUM, LOOMIS, SULLIVAN COUNTY, NEW YORK.

FOR the present, vaccine treatment in tuberculosis consists in :—

(*a*) The treatment of the tuberculous infection itself by some one or more of the tuberculins ; and

(*b*) The treatment of the secondary pyogenic infection by the specific bacterial product indicated by the character of the secondary infection.

Owing to the time and difficulty involved in the preparation of autogenous tuberculins, these are not generally employed, and especially since it has been shown that there is no special advantage in their use. On the other hand, the comparative ease of preparation and standardization of

autogenous bacterial vaccines to meet the requirements of the usual secondary infections is such that these are in much more common use, especially in sanatorium practice where convenient laboratory facilities are at hand.

The principles involved in this form of specific treatment are, of course, the same, whether employed in the sanatorium, in the dispensary, or in private practice.

The same questions arise as to choice of tuberculin; the selection of the patient; the dose, progression and interval, and the indications for interrupting or terminating the treatment.

Nevertheless, since, for obvious reasons, the sanatorium offers certain advantages to the satisfactory employment of a therapeutic measure which, like tuberculin treatment, involves a long period of time and a close observation of the patient, the use of tuberculin and its accessory bacterial vaccines can be considered somewhat differently in sanatorium practice and dispensary or private practice.

Tuberculin Treatment in the Sanatorium.

Selection of Patients.—At Loomis Sanatorium two classes of patients are advised to take tuberculin, viz. :—

(*a*) The class of incipient cases which have been under observation for a sufficiently long time to justify the belief that they are not progressive and are without fever or other evidences of a marked general toxæmia; and

(*b*) That class of more advanced patients, presenting evidence of "arrested" activity, who have been for some time without material change in their condition—either local or constitutional—but who still have cough and a bacillary sputum.

In a few instances we have given tuberculin, in extremely minute doses, in progressive febrile cases—more with a view of gratifying the whim of a very sick patient than with any

expectation of success in treatment—and our results in such cases have always been negative.

The use of tuberculin in special cases and the selection of patient depend upon one's conception of the action of tuberculin.

The one demonstrable and constant result of the suitable use of tuberculin is tuberculin immunity, whatever else tuberculin may or may not accomplish. I think the majority who have had any considerable experience agree on this point. With us this is the first consideration, and the line of pursuit throughout the whole course of treatment.

Realizing that tuberculin immunity is not immunity to tuberculosis, we, nevertheless, have come to feel that something more is at the same time accomplished in most cases during a well-borne course of tuberculin, and that additional protection is afforded the patient against his disease—both in the form of present resistance and against future tendency to relapse.

Of the theories so far advanced to explain the beneficial effects of tuberculin, other than those attending tuberculin immunity, none is wholly satisfactory, but that in some way general improvement and increased resistance follow its use in suitable cases is more and more felt to be a fact by those who employ tuberculin therapeutically.

While the same general considerations will determine the individual suitability for specific treatment in tuberculosis, the better opportunities for observation and control of the patient in the sanatorium permit of a somewhat more inclusive selection of patients here than it is wise to make in dispensary or office practice. Otherwise the indications and contra-indications are, of course, the same.

Choice of Tuberculin.—This seems to be a matter rather of arbitrary preference on the part of the physician, than of distinct or peculiar advantage on the part of any particular

tuberculin. Theoretically, one must agree that a suspension of B.E. in B.F. comes nearest to the ideal, but as a matter of fact the same results seem to follow the appropriate use of almost any of the many varieties. At Loomis Sanatorium we are in the habit of using B.E. and B.F.—the former chiefly, the latter more rarely, and in some cases combining the two. As is well known, B.E. has the disadvantage of producing at times, and without premonition, rather disagreeable reactions, and requires perhaps more care in dilution than do some other varieties. These disadvantages notwithstanding, our preference has been for B.E. in most cases, and yet without any very logical reason for the choice.

Dose and Interval.—In accordance with the idea that beginning with a small dose and progressing steadily, but not too rapidly, tuberculin immunity can be attained most surely, and with the least danger of unpleasant reactions, we are accustomed to proceed from the initial dose, in logarithmic scale, on the plan devised by Brown and Pope.

While, of course, there are many individual exceptions, based on peculiar features of certain cases, as a routine practice we begin with ·00000001 grm. (solid substance) B.E. and ·0000001 c.c. B.F., and proceed by 50 per cent., increases until ·0001 grm., or ·00001 grm. in the case of B.E., and somewhat larger doses in the case of B.F., are reached. Afterwards proceeding at the rate of 20 per cent., increases until the maximum dose or the termination of the course is reached. However, should intolerance for an increased dose develop at any time during the treatment, this plan of progression may be wholly changed.

At one time it was our endeavour to reach a maximum dose of ·005 grm. (solid substance) B.E. (we were not then using B.F.) in every case, and to achieve an immunity to the ophthalmic reaction, or to ·005 O.T. But this arbitrary plan was long ago abandoned, and no effort is now made to reach

a definite maximum dose. In fact, at the end of a course of from seven to nine months, it is rarely that we ever exceed a maximum of ·001 grm. B.E., and ·1 to ·5 c.c. B.F.

In supplementary courses of treatment given at intervals of from several months to a year after the termination of the preceding course, it is our custom to begin with a considerably increased initial dose, depending upon the individual's toleration during the previous course, and progress much more rapidly unless checked by symptoms. Recently, we have in a few such cases proceeded for the first few doses at the rate of 1,000 per cent. increases, when we have had reason to believe that immunity was high, but such a plan is not a wise one to put into general practice.

While during the earlier period of the treatment it is no doubt safe to give tuberculin twice weekly, it has seemed to us wise to lengthen the interval to one week as a rule when ·00001 grm. is reached. We have been influenced in this regard by the observations of Kinghorn and Twitchell, on the opsonic index variations following tuberculin administration, and by our own observations along the same line, from which it would seem that the blood disturbance caused by tuberculin in any considerable dose does not subside under five or six days. We have experienced fewer reactions since we have followed this plan.

There can be no doubt that individualization in treatment is quite as important in tuberculin therapy as in other fields of therapeutics, and the best success will attend him who most carefully individualizes and studies his patient both prior to beginning, and during the whole course of the treatment.

At Loomis Sanatorium we endeavoured for a long time to utilize the opsonic index as a guide to tuberculin administration, but abandoned the method when we became convinced that it was impracticable for this purpose.

Reactions.—In the sanatorium where such a procedure is practicable, we make it a practice to enjoin *comparative* rest on the day of the injection, and more *strict* rest for thirty-six hours afterwards (we usually give tuberculin in the late afternoon). In this way, no doubt, reactions are in a large measure avoided, and when they occur are more mild, as auto-inoculations are thus prevented. In dispensary and office practice such a plan is less practicable.

There can be little doubt that general reactions are, to say the least, undesirable. To just what extent organ reactions are devoid of danger, or actually advantageous, is still a matter of question. In young persons when the superficial lymphatics present the only demonstrable foci of infection, a reaction characterized by some swelling and tenderness in the infected glands is almost always followed by a distinct improvement.

In a case of extensive laryngeal and pulmonary involvement a course of tuberculin extending over a period of some eighteen months, and reaching a maximum dose of ·005 grm. (solid substance) B.E. several times repeated, presented a general reaction only once during the course, yet very frequently when the larger doses were reached gave a focal reaction in the larynx, which was invariably followed by marked improvement in the laryngeal lesion, and finally resulted in an apparently complete cure of this lesion.

In fact the most spectacular results are often observed in laryngeal lesions following tuberculin treatment where focal, not general, reactions are frequent.

One case of this sort, presenting some unusual features may be cited as showing the advantages, as well as the dangers, of sharp focal reactions in the larynx: A man, aged 31, with an extensive quiescent ("arrested") pulmonary involvement and an extensive destructive disease of the larynx, in which infiltration and ulceration had so distorted the parts as to make it impossible to definitely locate the usual landmarks,

entered upon a course of tuberculin (B.E.). The initial dose was ·00000001 grm. (solid substance). The increase was at the rate of 30 per cent., and owing to the extent and character of the lesion, the interval was one week. Following the dose of ·00000022 grm., which, it should be observed, was given during a slight exacerbation of the laryngeal symptoms, there occurred a most violent organ reaction in the larynx. There were no constitutional symptoms and no evidence of any change in the pulmonary condition, but swelling and œdema in the larynx lasting some forty-eight hours, and causing a most distressing dyspnœa, made it a matter of grave question whether to intubate or perform a tracheotomy. The more distressing symptoms subsiding, however, neither was done and the patient made a quick recovery from the reaction—a most rapid and marvellous improvement in the laryngeal lesion followed, and in a remarkably short time the larynx was apparently free from disease, and the voice was almost completely restored.

There are three striking and, in our experience, unique points in this case :—

(*a*) The remarkably small dose of tuberculin which caused the reaction.

(*b*) The violence of the focal reaction, limited as it evidently was to the laryngeal lesion, in the absence of any demonstrable general reaction ; and

(*c*) The prompt recovery following the reaction.

The more common laryngeal lesions do not contraindicate the employment of tuberculin, but in those cases where an old fibroid infiltration has already appreciably narrowed the glottis, a focal reaction may undoubtedly cause a sudden and very alarming stenosis, and such a lesion, in our opinion, contraindicates tuberculin treatment.

Treatment of Secondary Pyogenic Infections by Autogenous Vaccines.

Selection of Patients.—Usually, though not always, these are cavity cases with persistent high fever, which does not yield to complete rest in bed. So far we have limited the selection to hospital patients, where constant observation and control are possible.

Procedure.—The washed morning sputum is plated and different colonies subsequently transplanted in the usual way. For the purpose of determining, as far as possible, which organism is chiefly responsible for the symptoms, we still believe that the opsonic index determinations are of great value.

A series of observations are, therefore, made of the temperature, and the blood taken simultaneously at intervals of three or four hours over a period of twenty-four hours, or at longer intervals extending over several days. The more abundant secondary organisms, of which there are usually but one or two varieties, are carried through with the tubercle bacillus (from a stock emulsion), and that organism which gives the most typical "diamond curve," with the temperature curve, is selected as the most probable chief source of the secondary infection.

An emulsion is then made from a growth of this organism, sterilized at 60° C. and standardized by counting with erythrocytes from a source of known value. It is then ready for use.

Dose and Interval.—An initial dose of such vaccines as we have used at Loomis for this purpose is from twenty to forty million, which, if no contraindications arise, is first repeated and then increased at the rate of 100 per cent. until from one hundred to two hundred million is given at intervals of from two to ten days, according to circumstances.

The attempt is made to time the doses at the fall of the patient's temperature.

We have observed no untoward effects from such treatment. We have never found that subsequent temperatures are any higher following an injection.

Occasionally a vaccine is apparently inert, probably due to error in technique on our part or to mistake in identifying the cause of the infection.

In the majority of cases in which we have used such vaccines, we think we can trace a relation between the treatment and a remission in the symptoms, chiefly in lowered temperature. However, our experience has so far been too limited to permit of any very positive statement as to the value of the methods which we have employed, or for that matter in the practicability of this method of treating the complicating pyogenic infections in pulmonary tuberculosis at all.

The most that can be said is that the plan seems reasonable and that, so far at least, our results seem to justify further effort in this direction.

DISCUSSION.

Dr. RANDALL said that the applications of opsonic treatment by vaccines to diseases of the ear have been too limited and carried on by too few investigators to have reached definite results. Hardly a hundred individual cases are recorded, and, while these are encouraging, especially to enthusiasts, there are too many loopholes for any estimate of them to carry conviction to clear minds. The permanence or uniformity of success which should distinguish a monumental improvement in therapy cannot yet be considered established, while some of the reports are open to suspicion of being none too well posted, or else too pessimistic as to the older measures. Closer scrutiny of the instances of its employment will probably give greater confidence in the possibilities of the method, and it is hoped that this joint consideration of the subject will serve to crystallize into more available shape its practical applications, and that growing experience will show more frequent realizations of the hopes and claims of the enthusiasts.

A paper on "Vaccine Therapy in Otology" was read by H. C. Reik, M.D.

A paper on "The Value of Vaccine Treatment of Chronic Inflammatory Diseases of the Accessory Sinuses of the Nose" was read by H. S. Birkett and J. C. Meakins, of Montreal.

Also a paper by D. C. G. Coakley, of New York.

Dr. F. C. Cobb (of Boston) said that the question is a most complicated one, and the results thus far obtained are both discouraging and encouraging. In a series of twelve cases at the Massachusetts General Hospital, all of the patients treated with vaccine made from a bacillus found in all cases, a general improvement was shown, and yet no absolute cure can be reported. Results seem to justify further efforts in this direction.

Dr. J. Solis Cohen (of Philadelphia): I have had a very prolonged experience with tuberculin. For thirty years I was consulting physician of the Home for Consumptives, and gave the first injection of tuberculin in Philadelphia before my class at the Jefferson Medical College, upon a patient with advanced tuberculosis of the larynx, in the early eighties. Ten years ago I heard that that man was well and was a successful ranchman in Wyoming. I have not heard from him since. Fifteen or sixteen years ago a man came to me from the South with extensive ulceration of the larynx. He was placed under treatment, and after a number of months his disease was arrested. Two years afterwards his life was insured for £100,000 in the Mutual Life Insurance Company of New York. In that case, not only was the injection given hypodermically, but the tuberculin was rubbed over the laryngeal surfaces, and he took rectal injections himself every night. There is no doubt that in this case there was a great success. I know of several other cases still living at different periods of five to fifteen years or more, and doing well. The tuberculin that I have used has always been the old tuberculin of Koch, except when we were unable to get it, and then other forms were used, but did not appear to present any special advantages. These injections were used very much as the last two speakers have described, beginning with minute doses and gradually increasing them, and studying the patient rather than the disease.

I would like also to state something else. When I began the study of medicine some fifty-five years ago, I studied under a preceptor, as was customary at that time; and it was his custom then to apply fly blisters as near as possible over the site of the lesion of phthisis—we knew nothing of the *Bacillus tuberculosis* at that time; many of the cases improved, and since the tuberculin and serum treatment have been applied I have come to the conclusion that possibly the absorption of some of the serum raised by these blisters was beneficial in the same manner as the serum when injected under the skin; and, acting on that principle, it has been my custom with many of my patients to blister the chest below the clavicle, taking care that the blister shall not burst, so that the patient's own serum shall be absorbed on the same principle as the autogenous methods. I do not often attend these meetings, but would like to give my testimony as to the advantage of this treatment in properly selected cases and under proper precautions.

Dr. V. Y. Bowditch (of Boston): I can rank myself in the first class spoken of by Mr. Miller, who tried it as soon as it was given to the public and after a few cases gave it up. I abandoned it after a few cases, largely influenced by the statement that there was danger of causing disseminated tuberculosis, and for many years I had a great repugnance against it.

Finally, I felt that I was doing injustice to many patients who might possibly be having treatment withheld which would do them good. Feeling with Dr. Griffin that certain cases had been going on under dietetic and hygienic treatment and making no progress, we agreed to give them the benefit of this treatment, and did so ; the results were so startling that we felt justified in going on. To make a long story short, in addition to beginning with cases which have not been doing well, we now begin on the incipient cases also. My position now is that of being greatly impressed with the tuberculin.

Dr. WALTER A. GRIFFIN (of Sharon, Mass.): In continuation of Dr. Bowditch's last remarks, I would like to say something further what we have been doing at the Sharon Sanatorium. We began with one case which had been to us before, and under hygienic treatment had been discharged with the disease apparently arrested. In seven months she was back again, and although we kept her under hygienic treatment for five months she made no improvement beyond a certain point. It was this case which Dr. Bowditch said would be worth trying with tuberculin. We gave her treatment for five months, at the end of which time the tubercle bacillus had disappeared; and now she has been at her laborious work in the kitchen. I saw her within a month past and went over her chest, and found her in very good condition. The second case was similar in that the patient had been with us for several months and was not only not doing well but was losing ground; the cough was increasing and there were beginning objective signs in the larynx. She had tuberculin treatment for seven months, and it is her boast now that she has been out nearly five years, and has not seen a doctor at any time within that period. We have now to report on twenty-eight cases which have had tuberculin treatment at Sharon and have been discharged for more than a year. Of these twenty-eight patients, six have died ; two were really too far advanced to warrant advising tuberculin, but took it at their own request; four others were advanced cases and were given tuberculin because it did not seem possible that they could improve under ordinary hygienic treatment, and it seemed to be a forlorn chance for them. Four others are not doing particularly well. They were all advanced cases, but I am afraid they are going downhill. This makes eighteen cases out of the twenty-eight which are doing well, and this seems to be a comparatively good record, when all of the cases, with the exception of three, were more than incipient, and all but the three had tubercle bacilli in the sputum. These three were given treatment for certain special reasons.

Dr. NAGLE (of Boston): I do not want to be too enthusiastic about vaccine therapy, but I believe it is a valuable adjunct in treatment. I wish, however, to emphasize the importance of the proper preparation of the vaccines, and the method of giving them.

Dr. MINOR (of Asheville): The point is, it seems to me, shall we use tuberculin in all cases, or only in carefully selected ones. The tendency of some to-day is to use it in every case, which I do not believe to be wise. I myself have slowly come round from scepticism to belief in the value of

tuberculin, granted it is used with a careful selection of your cases. I do not believe a patient should be put on tuberculin as long as he is making progressive and steady improvement; but I believe it to be a valuable aid in those cases which, after having done well for a while, reach a period of standstill, and in these cases I have at times seen wonderful effects. However, the general acceptance of the idea of its applicability to all cases would do much harm. Only recently I have seen an incipient case of tuberculosis turn into a rapidly disseminated and hopeless one by daily injections of tuberculin by a quack, and honest men, yet with dangerous enthusiasm, might well do something of this sort. In short, I believe that with a careful selection of cases it will be valuable, but that in many its results are absolutely negative, and in a few, without the greatest care, can be harmful.

Dr. W. B. JOHNSON (of Paterson): The discussion is developing along the lines of tubercular disease and tuberculin. I would judge that tuberculin has been successful in a number of cases, but the important consideration to the otologist is what can be done with the autogenous or stock serum for the destruction of bacterial elements which enter into the diseases we are called upon to treat. I have followed serum and vaccine therapy for a number of years. One case of sarcoma of the pharynx I treated with the Coley serum with success; it was one of the few cases that were successful. I have also used the stock vaccines and serum, and while it seemed as if in some cases life was prolonged by the use of the serum and vaccine, it was not with me successful. It may have been that the preparations were poor. It has been stated lately that success has been attained by the use of stock vaccines, but in the cases I have known which have been limited to those of autogenous vaccines prepared in Jersey City by Dr. McDowell, they also seemed to be unsuccessful. I do not wish to be understood as in any way depreciating the value of experiments in this direction, but I am still waiting and hoping that the results reported will make it desirable for all of us to use these remedial agents for the destruction of bacteria which enter into the diseases we have to treat.

Dr. CASSELBERRY (of Chicago): I have been particularly impressed with the favourable statement which has been given by one of the essayists, Dr. King, who refers to the pronounced favourable effects of tuberculin on laryngeal conditions in pulmonary tuberculosis, since we have not had up to this time any judgment or verdict in this respect based on so large an experience as he has had in this complication of tuberculosis. When the larynx is involved it becomes almost the dominant factor in the case, and our results up to this time have been discouragingly bad. Therefore, if—as we have hoped for the last few years with the trend of the verdicts with respect to tuberculosis—we have a remedy in tuberculin which will have in any considerable percentage of cases such effect as he has stated, we have made an enormous advance. He states that in those cases in which he happened to cause a pronounced reaction from larger doses than was

intended the effect on the larynx was good. I have likewise noticed at times in making the tuberculin test when it was given for the purpose of producing a diagnostic reaction, that weeks, even months, afterwards there has been marked improvement in the larynx. Although noticing this, I scarcely trusted to my own observation, attributing the credit to other circumstances—but the two go together; he has attributed it to tuberculin, and I have no doubt that he is correct. I have also had a limited experience with respect to the effects of the present-day minute doses in laryngeal cases, in which, however, recourse was made jointly to other medical and surgical treatment. Elsewhere I have reported 40 per cent. of arrested cases in laryngeal tuberculosis, some of them being those in which tuberculin in small doses had been given as an element of the treatment. Many of the men who see large numbers of pulmonary cases fail to examine the larynx. If these men would take note of the condition of the larynx and the effects on conditions there produced by tuberculin treatment, much good would be done to humanity in the direction of laryngo-pulmonary tuberculosis.

Dr. DUNN (of Asheville, North Carolina): There are only one or two points in these very excellent papers which I wish to comment upon. First, I want to say that it is just such good, conservative papers as these which help. The tuberculin cause has been damaged more by optimists than by anything else. The effect of tuberculin in laryngeal tuberculosis has interested me for many years. I always examine the larynx, and I have been particularly struck with the improvement taking place in distinct laryngeal involvement. It is not so very striking in the advanced cases, where there are marked destructive changes. As to the improvement following the reaction, it has been my custom to watch for reactions, and I have in many instances seen the beginning of improvement in the laryngeal reaction; it has happened so frequently that I am convinced it had some association with the reaction. As to the different forms of tuberculin, I have used a number of them; I used the old tuberculin constantly and exclusively for nearly ten years; for the last few years I have used the human bacillus culture, and recently I have used the bouillon filtrate of Denys, and I have used other forms in vogue at times; I have used the bacillus emulsion and the bouillon filtrate mostly of late, but the immediate results have been practically the same; I cannot see that I have obtained any better results from bacillus emulsion or from bouillon filtrate than from the old tuberculin. Sufficient time has not yet elapsed to form a positive opinion as to comparative permanence of results of various tuberculins. I am very conservative as to its value; on the other hand, I do not think our attitude should be that of giving a person the choice of taking it or not as he pleases. When I give tuberculin to a patient I expect him to take it, just as I expect him to obey when I tell him to go to bed, and if I am convinced of its usefulness, that is my privilege. As to waiting until the improvement under hygiene and diet has been tried,

that is not fair; if we are convinced that it has a value in making results more permanent, it is our duty to our patients to do that which gives them not only the best immediate results but the best permanent chance. The time element is a very important one. I have known of a number of patients who took it for only a short time and then discontinued it and were apparently put into a state of instability. That has been my impression. Another thing, the greatest disadvantage in tuberculin is that the doctor puts his faith in his hypodermic syringe, and does not pay enough attention to the life of the patient. We should never lose sight of the fact that it is a more or less important adjunct. Sometimes the patient puts more faith in what he gets from the hypodermic syringe than from what he does for himself. We should make them believe that what they do is of far more importance than what we can do, and that the hypodermic injection is an aid, and nothing more.

Dr. I. H. HANCE (of Lakewood): A few months ago I read a short abstract of an article written by a Frenchman—only a few lines, but pertaining to what has been said about auto-inoculation—to the effect that in treating pleuritic effusions he withdrew 2 c.c., and then reinoculated his patient. He reported four or six cases treated in that way. In view of this, I asked Dr. Trudeau if anything had been done at Saranac Lake with auto-inoculation of serum. It occurred to me that if that were drawn off as horses' serum is, it could be successfully used on the patient, the serum being drawn from his or her body. I am out of that work now, doing more general work, but I spoke to-day to two men who have opportunity to do that sort of bacteriological work. It is in line with what Dr. Cohen said, leaving the serum under the blister for reabsorption and auto-inoculation.

Dr. REIK: I think that if I had had the opportunity of drawing my conclusions after having heard these papers, I should not make them different. I regret that more was not said regarding the use of vaccines in relation to the nose and ears. The fact that the climatologists seem to have gotten away with the discussion may perhaps be explained by the well-known timidity of the rhinologists and the well-recognized modesty of the otologists. One point was brought out by Dr. Birkett, and confirmed by the negative reports of results found by both Dr. Cobb and Dr. Coakley—that one positive result is worth many negative findings. Then in his conclusion that treatment by vaccines will sterilize the accessory sinuses of the nose—and there seems to be evidence to back up the statement—he has given us something very important to think about. None of the essayists spoke of many positive results having been obtained in the treatment of the nose, and if that be true, that we can bring about a state of sterility of the secretions, much can be accomplished by the treatment, even though some remains. None of us are afraid of sterile secretions from the nose. We have good reason to be afraid of infectious secretions from the nose.

A STUDY OF THE CLIMATOLOGY OF CANCER, WITH NOTES ON ITS CAUSE AND GENERAL INCREASE.

BY ROLAND G. CURTIN, M.D.
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PREFACE.

IN 1904, while journeying to Panama to attend the Fourth Pan-American Medical Congress, I had the pleasure of sailing from New Orleans across the Gulf of Mexico to Colon in a steamer with the late Nicholas Senn, of Chicago. He was a great traveller as well as a great observer, and our conversation was largely on climatological subjects, and among others we discussed cancer and its relation to climate, race, &c. He stated that in the South Sea Islands and in Africa it was almost unknown among the natives. I suggested to him that perhaps a study of the subject climatologically might throw some light on its causation. Since that time I have been on the look-out for anything relating to the subject, and give you the result of my efforts.

In April, 1906, at the International Medical Congress, held at Lisbon, Portugal, Dr. Senn delivered the oration for the United States. The subject selected by Dr. Senn was "A Plea for the International Study of Carcinoma." At the close of his address, he suggested the appointment of an international committee to study the subject from a non-parasitic standpoint, the committee to report at the next International Medical Congress.

The study of the cause, the nature, and the treatment of cancer has only been prosecuted with great vigour for

the past ten or fifteen years. Up to that time very little was known scientifically on the subject of its pathology, but under the stimulus of adequate appropriations and valuable donations for the support of scientific laboratories many learned investigators have entered the field and much has in late years been learned about the secrets of the disease; but as yet the cause has not been determined, and many theories heretofore entertained have been upset by these patient workers and new ones substituted.

The study of the subject should be looked at from all sides, and why should we not, as climatologists, view it from our standpoint, and try to help in the quest of the cause and the developing influence of this great and increasing scourge?

Investigation has been and is now being made as to the distribution of the disease, the influence of race, soil, heredity, varieties affecting different organs and animals, as to whether it is inoculable, is it due to a parasite or not?

Professor Leo Loeb, M.D., of the experimental pathological laboratory of the University of Pennsylvania Medical Department, reports in *Old Penn Weekly Review* the following observations:—

"At first we made a comparative study of cancer among animals, and found that special kinds of cancer are characteristic for certain species of animals, just as we know that man is especially prone to be attacked by cancer of certain organs." He further states: "We especially noticed that cancer may be found much more frequently in certain localities and in certain cages among smaller animals." He adds: "Is this endemic condition due to hereditary conditions or to infection? Probably the former. The question is, however, not yet decided with certainty."

"We are nowhere able thus far to prove the presence of parasites as the cause of cancerous growth. Only when

cancer cells were inoculated did we obtain tumour growth in other animals."

In pursuing my investigations I have written to the health officers of all the important cities in the United States with a few inquiries that I thought important, and have had but few responses to my request for statistics and data. I wish to state that Dr. M. O'B. Ward, the statistician at the Board of Health, Montreal, answered satisfactorily every question I asked. I append his admirable report. San Francisco, Boston, New York, and Philadelphia have sent much useful information; also Dr. Gorgas, chief sanitarian of the Canal zone in Panama, and Dr. John Guiteras, of Havana. I have nothing very much that is new to give you, but there has been frequent allusion to climate and cancer, but it is scattered here and there in volumes, text-books, journal articles, reports, Governmental and other statistics, so that I have tried to sift out so far as possible the important matter therein contained, and the result is given you here to-day. It will be the writer's effort to arrange this information and try to compare the statements of the different authors and give the apparent conclusions.

In regard to statistics, they may be absolutely accurate or very inaccurate, from various causes.

First, the boards of health may be at fault. Some of them tell physicians that the diagnosis of *tumour* will not be accepted, so a forced specific name for the disease must be used, and cancer is one that is very apt to be chosen in the dilemma. Another cause of indefinite statistics is that carcinoma, epithelioma, and sarcoma are always included under the head of cancer in the statistics. This combination very much retards the study as to the different forms of malignant disease.

Second, after an operation and a fatality the operator may cover up his non-success and mollify the feelings of the

relatives by saying it was an incurable cancer, and would have probably been fatal a little later. In fact, one surgeon told me that when a patient died he always called it cancer.

Third, the profession generally are to-day better diagnosticians, so far as tumours are concerned, and in doubtful cases very often an exploratory incision has revealed the true condition present.

Fourth, statistics may be juggled so as to make a city or State appear to have less malignant disease than it actually has.

It is my hope that we may point the way so that the increase of this dread disease may be prevented or greatly reduced. Every guide-post put up in the field of science may save those newly entering it from wandering aimlessly about, looking up questions already settled. Perhaps we may in this way help by disseminating the information already known among our brethren.

Geography and Climate of Cancer.

In *Alaska* cancer is very scarce among the Indians, their death-rate being 5 per cent., but among the blacks it is 10·20 per cent.

Canada.—It is reported that cancer is quite common among the whites in all parts of civilized Canada, but among the native Indians who live in their original primitive way it is very rare.

The statistics of the whole population of Canada are not obtainable, the most of the figures are from the densely populated districts. In asking for data the Health Officer of Montreal sent me the following information, which gives a most excellent survey of that city, giving the report of the observations of the official. It reads as follows :—

"MONTREAL, *April* 15, 1910.

"Dr. Roland G. Curtin,

"Philadelphia.

"Dear Sir,—In answer to your letter *re* 'Cancer,' I may state for the years 1907, 1908, and 1909 the deaths from cancer were as follows :—

	Males	per 100,000	Females	per 100,000	Total	per 100,000
1907	90	24·52	144	39·24	234	63·76
1908	77	20·26	153	40·26	230	60·52
1909	104	26·32	163	41·26	267	67·59

(Prior to these years deaths from cancer were not recorded by sexes.)

PERCENTAGE OF CANCER TO TOTAL DEATHS.

1907	90	1·08	144	1·73	234	2·82
1908	77	0·88	153	1·75	230	2·63
1909	104	1·19	163	1·87	267	3·06

DEATHS FROM CANCER FOR THE LAST TEN YEARS.

1900	146	Proportion per 100,000	50·57 (after influenza)
1901	196	,, ,,	65·92
1902	158	,, ,,	56·86
1603	206	,, ,,	71·98
1904	180	,, ,,	61·06
1905	167	,, ,,	55·00
1906	213	,, ,,	60·76
1907	234	,, ,,	63·76
1908	230	,, ,,	60·52
1909	267	,, ,,	67·59

"Fifteen of the 267 deaths in 1909 occurred in various institutions and are not comprised in the wards. Coloured people are so few in this city as to be practically of no importance from a statistical point of view. We have no distinctly poor districts, and it is hard to say where poverty is most prevalent. Last year I made a table for the first time of deaths from cancer in the different wards and I found it more common in those occupying higher ground. There are five wards on a low level with a combined population, estimated at 107,200; the cancer death-rate in these amounted to 41·04 per 100,000. What I would call seven intermediate wards have a combined population estimated at 97,700 with a cancer death-rate of 53·22 per 100,000. The ten higher-level

wards (though parts of these are on a lower level) have a population estimated at 194,200 with a cancer death-rate amounting to 80·32 per 100,000. Two of these higher-level wards contain the residences of the wealthier classes, and in them the disease is decidedly more prevalent than elsewhere. Their combined population is estimated at 30,900 and their cancer death-rate amounted to 122·97 per 100,000.

"Yours truly,

"M. O'B. WARD, M.D.,

"*Statistician, Board of Health.*"

If I had procured more reports like this one, I could have made the paper more interesting and instructive. The contour of Canada very much resembles that of the United States, the valleys, mountains, and plains in both countries are more or less continuous. The cold winds of the north sweep down the valleys to the United States and the warm winds of the Southern United States travel north, so that the changes in temperature in Canada, especially in the summer, are very great, being sometimes very hot indeed. The summers are shorter and the winters longer than in the United States. In Montreal, in 1891, the mortality was 39 in 100,000, in 1909 it was 67·59, a very great increase. A year and half after the advent of the influenza the death-rate jumped from 50·57 in 1890 to 65·92 in 1901, again falling to 56·85 in 1902.

United States.—As we go north from the southern border of the United States the disease becomes more common, and this is usually the case in all countries until we meet the colder regions. Williams states that cancer is twice as common in the Northern as in the Southern States. It is very rare among the red men living in a primitive state. It is reported as being plentiful in the interior of Michigan and the Southern part of Wisconsin. On the Pacific Coast it is much more common in the State of Washington on the northern border than in Southern California.

Dr. William G. Mitchell, Health Officer of San Francisco, states that he thinks he can safely state "that the said mortality in that city is evenly distributed, and that there is no excess of deaths among the poorer classes from this cause" (cancer). The estimated population in 1909 was 475,000 with 414 deaths (1·147 per 1,000). Winter mean temperature in San Francisco is 51° F.; summer, 60° F. Philadelphia winter mean 32·3° F.; summer 76·2° F., showing the climate is much warmer and more variable. Davidson says that cancer is more common on the Pacific Coast. Recent statistics do not confirm this statement.

STATISTICS OF THE BUREAU OF CENSUS.

MORTALITY DEPARTMENT.

The Registration area shows the following ratio per 100,000 of population, 1908.

California			104·2	New Hampshire	87·3
Colorado			62·7	New Jersey	67·5
Connecticut			76·1	New York	79·5
Indiana			64·7	Pennsylvania	63·3
Maine			96·4	Rhode Island	83·6
Maryland			62·9	South Dakota	46·2
White	67·6			Vermont	92·2
Coloured	43·7			Washington	72·0
Massachusetts			93·7	Wisconsin	65·1
Michigan			72·9		

California is the highest.

The New England Coast States are all high.

Maine, 96·4; New Hampshire, 87·3; Vermont, 92·2; Massachusetts, 93·7; Connecticut on Long Island Sound, 76·1.

Cancer is more common in New England than in New York, Pennsylvania, and Ohio. South Dakota has the lowest rate, 46·2. It is much less prevalent in the Mississippi Valley and in the ten Southern States. We must remember that the negroes in some of the Southern States outnumber the whites. The census taken in 1909 was not complete, for in many districts they collected no data. The deaths in 1909 were given as 43 per 100,000 inhabitants. The urban death-rate was 65·71, and the rural 65. These figures include all tumours.

In the north-easterly part of the United States the mortality is greater than in any European country. In the Southern States the mixture of the blacks with the white race is quite common, and the death-rate in such people is increased, over and above that of the pure African.

Mexico.—Cancer is less common than in the United States. Jourdant states that it is almost unknown in the hot regions of Mexico, but in the cooler highlands at the same latitude it is much more frequent. The cases are largely in those of European descent. The semi-civilized and half-bloods are sometimes afflicted. The native inhabitants are rarely affected.

Central America.—Here it is rarely met with. The death-rate in Guatemala is given by Williams as 4, and in Honduras about the same as in Panama, which is almost *nil* among the natives.

Panama.—Dr. W. C. Gorgas, Chief Sanitary Officer of the Canal Zone, Panama, has given me the data of the deaths of the Zone in 1909, from which I glean the following facts:—

The employees of the Canal and Panama R.R. consist of 11,662 whites and 35,535 blacks, totalling 47,197. In 1909, 6 died of cancer, 3 whites, all of whom died of cancer of the stomach; and the same number of blacks, one each of stomach, tongue, and gall-bladder. The blacks outnumber the white men then 3 to 1. From the above figure it would seem to show the whites were more than three times as liable to this disease as the negroes. The whole number of cancer cases seem more than usually small, but we must remember that most of the employees are below the usual cancer age, which would account for the very small number. The report of 1909 would seem to show two things:—

First, that cancer is a rare disease in this tropical region, even among the whites.

Second, that the deaths are more common among the whites than blacks. The black employees come primarily from

the Barbadoes, Colombia, Jamaica, and Panama; in fact, from South America, Central America, West Indies, also many from Asia and Europe.

It is found generally that the white and negro races suffer very unequally in all climates. Davidson tells us that the death-rate in Massachusetts per 100,000 living white males is 20·50, and 5·85 for the coloured males; white females, 35·44; coloured females, 19·32. He further states that it is more frequent among the Irish and German immigrants than in the native white population.

Deaths from cancer and malignant tumours on the Isthmus:—

DEATHS FROM CANCER AND MALIGNANT TUMOURS ON THE ISTHMUS.

					Deaths	
	Population	Deaths	Col. pop.	Whole pop.	Col.	White
In 1909	135,000	33	100,000	27,000	18	14

Cancer is exceedingly rare along the Canal, as the great majority of employees are under cancer age; the statistics, therefore, are more favourable than they should be. But the statistics confirm previous observation—that the black race is not so susceptible as the whites, for with about one-third the number of the whites they had about as many cases—14 to 18.

West Indies.—Dr. John Guiteras, of Havana, Cuba, writes that the deaths have increased in that city from 428 in 1900 to 977 in 1909.

Population in 1899, 1,572,797.

Population in 1907, 2,048,980.

In 1909 the deaths from cancer were: white, 731; coloured, 264; total, 977.

Cancer is rare, except in the cities, mostly occurring among the better classes and those of foreign blood.

Bermuda.—The deaths in 1900 were 423; 13 were due to malignant tumours, or 1 in 33. The deaths were 1 in 18 white, and the coloured 1 in 56.

The Bahamas.—As given by Sir Astley Cooper in 1840, in the general mortality of 1,231 there was only one who died of cancer.

Jamaica.—In 1888 the mortality was 12 per 100,000 inhabitants. In 1895 it had increased to 19. In 1888 one-fifth of the cancer deaths were among the English, who were largely in the minority.

South America :—

British Guinea.—The hospital cases numbered 148,221 in 1903 and in 1904 ; 105 had malignant tumours. It is quite uncommon and almost all the cases are of Europeans.

Dutch Guinea.—Malignant disease very uncommon.

Brazil.—Cancer very rare, as is usually the case in the regions near the Equator.

Rio de Janeiro.—The ratio is 26 per 100,000.

Uruguay.—Cancer rather common in Uruguay. In 1897 the deaths were 47, or 3·28 per cent. of the total deaths. The deaths in Uruguay and Argentine are greater than in Brazil, where it is less frequent than any part of the Continent.

In the *Argentine Republic* Williams says it is fairly common, especially in Buenos Aires, where the death-rate in 1900 was 91.

This bears out the statement of Sondre that the malady is rarest in equatorial regions, increasing in frequency with the remoteness of the Equator ; but as we go north of the temperate region it decreases.

You will notice Dr. Williams says ubiquity differentiates cancer from all parasitic maladies, for even tuberculosis is far less ubiquitous than cancer. Cancer and tuberculosis centre in temperate climate, whereas malaria is the predominant malady of the Tropics. (He might have added yellow fever.)

Europe.—In this grand division of the earth's surface the

disease is much more prevalent—Williams says "that it is probable that with the exception of China, more deaths occur from this cause in Europe and the United States than all the rest of the world together." It appears that along the shore of the Mediterranean the least cancer is found in all Europe. Here we have the dark-skinned races—Spanish, Italians, Portuguese, Turks, Greeks, including the Islands of Sardinia, Sicily, and Corsica (Williams).

Austria had very little cancer, from 1885 to 1887 the deaths were 480 in a million; in cities and towns it was most prevalent.

The death-rate of *England and Wales* in 1881 to 1885 was 544·6 per million.

In Scotland the mortality was 575 per million. In 1886, 59 deaths in 100,000 (large towns 61, small towns 58, rural districts, 61). The eastern side was more affected than the western or centre. Cancer deaths in 1905, death-rate 890 per million, living population.

In Scotland it is less prevalent in the south, but in England, Wales and Ireland the disease is distributed uniformly alike in the coast, mountains, and plains.

The Registrar-General of England states that cancer has been most fatal in London and the south-eastern and south-midland division (London has much of the surgical work of the outside country).

The disease was not found to be more common along river courses, nor seemingly affected by any particular geological formation. The mortality among the poor and rich was the same, and also in the agricultural and industrial districts was quite similar. There has been a gradual increase in the mortality in successive years since 1857. Common in both sexes, but more common in males at all age periods. The increase has kept low with advancing age. Disproportionate increase in the middle period of life.

Iceland.—In Northern Europe, although not unknown, it is much less infrequent than in the rest of the Continent. Hirsch says ·07 in 100,000 living population. The *Danish* Government reports that cancer is not unknown in the Arctic regions.

Belgium.—In Brussels it seems to be increasing rapidly; 1864 to 1873, 390 per million; 1874 to 1878, 420 per million. It is found to be most common in Brabant and East Flanders, and much less in Luxemburg and Lemberg.

Netherlands.—From 1884 to 1888, 656 per million.

Norway.—Quite common, and increasing rapidly. Thirty-two in 1,000; total mortality before 1877 (to 1866), 60 in 1,000 deaths. Some districts have fewer than others, but no seeming climatic reasons can be assigned for such difference. Christiania 5·0; Hamar 9·8; Christiansand 4·3; Bergen 5·4; Trondhjem 6·6; Tronso 6·0; Hedemarken 10·6; 8·8 in Christiania. Eastern districts of Hamar cancer is more prevalent than in Christiania on the coast. In Faroe Islands, where the race is the same, the disease is said to be unknown. Davidson says: "We certainly have no reason to attribute the difference to climate or soil, and if it is due to any peculiarity of food or the habits of the people, I cannot imagine what these may be."

Germany.—Cancer in the Western part is a common disease. It is less common in the north than in England or Sweden. Statistics indicate that in all parts of the Empire it is increasing as in 1881, 312 in a million; 1887, 383 in a million. The average death-rate in 1876 to 1885, 697 per million. The cities and larger towns have more than in a scattered population.

DEATHS FROM CANCER PER MILLION.

1881	1882	1883	1884	1885	1886	1887
312	318	335	349	355	385	383

Italy.—The statistics include all malignant tumours, 647 per million (England 544·6). The disease is more prevalent in the northern part than in the south.

Switzerland.—More fatal in Switzerland than in England (p. 190, Davidson) or any part of Europe.

Asia.—Very little is known of the history of cancer in Asia. We have no statistics from the northern part. The little we have of China and Japan shows that the disease is quite common among these two races, especially the former.

Philippine Islands, South-eastern Asia, Indian Archipelago.—Dr. Arthur F. Coca, of St. Paul's Hospital, Manila, Philippine Islands, now of Philadelphia, gives the statistics of the two hospitals where the special study of cancer has been conducted.

From July 1, 1907, to July 1, 1909 (three years), 5,638 patients were admitted, of whom 1,667 were surgical cases. They had sixty-four cases of carcinoma in 124 tumour cases. The islands have many Chinese and Japanese who are especially liable to the disease.

On the *Arabian plateau* cancer is said by Davidson to be practically unknown.

India.—Hard cancer is rare. It is reported rare in Lower Bengal, but epithelioma is rather common. In Lower Bengal epithelioma is quite common. In the Deccan tableland it is not a common disease.

In Bombay, one in 1,000 deaths, but among the English twenty-eight in 1,000 deaths, was recorded. In Kashmir epithelioma is very common.

Elmslee says he met with thirty cases in 5,080 patients. He ascribes the frequency to the habit of carrying earthern pots with live charcoal in cold weather in proximity to the skin under their loose dresses.

At Hyderabad in 2,657 operations in 1886 two were from malignant disease.

Tasmania, south of Australia, has a greater percentage of deaths from cancer than any other of the Australian Colonies; yet it is not the most civilized. From 1882 to 1886, 48·2 per 100,000.

Polynesia.—New Caledonia. Only two cases of epithelioma observed.

Persia.—Seldom met with.

Mauritius.—An island in the Indian Ocean under British rule; cancer 6·09 per 1,000 living population.

New Caledonia is situated between Australia and the Fiji group. It is 200 miles long and 30 miles wide. It is of volcanic origin. Dr. Bayer saw two cases of epithelioma of the lower lip in smokers.

Australia. — The death-rate per 100,000 inhabitants: Victoria, 47·0; South Australia, 32·0; New South Wales, 28·4; Queensland, 24·9; Western Australia, 36·0. In Victoria, the death-rate was in 1871 to 1880, 37·1, in 1882 to 1886, 47·0.

Cancer seems to be increasing in the southern colonies. Among its savage people it is rare or unknown, but is rather common among the whites.

New Zealand, situated south-east of Australia, is composed of three islands. Cancer rate, 32·6 per 100,000 for ten years ending 1888. It has increased in ratio; in 1879 it was 26·3 per million; in 1888 it had risen to 43·4.

Abyssinia.—East Coast of Africa. The land is low, flat, hot, and dry, the coast skirting the Red Sea. Above this is a tableland 7,000 ft. high, which is much cooler. Davidson tells us that Dr. Petit says cancer is rather frequent, but Dr. Blanc said his observation was different, having seen none. It is probable that they visited different parts of the country.

Dr. Senn says cancer is unknown in Central and rare in all parts of East Coast of Africa.

Davidson says cancer is not absolutely unknown but rare in Central and East Coast.

Bechuanaland.—It is an elevated country 4,000 to 4,500 ft. high, extending from Orange River on the south to Lake Ngami on the north, and from Transvaal in the east to Namaqualand on the west. Dr. Senn states that it was unknown among the blacks in Mombasa under British rule; inland 40° from the Equator, almost sea climate.

At *Dar-es-Salaam*, German colony, Dr. Senn heard of one case of stomach cancer in a native and in Equatorial Africa, one—a black boy on the sea-coast, or low ground.

Zanzibar.—Dr. Senn found only two cases in natives noted. Tropical climate: temperature 79° to 73° F. It is a coral island.

Mozambique.—Portuguese South Africa. Only two or three cases known, located upon an upland, near coast, tropical climate, a native population. Temperature reaches 120° F. at times.

Bieva.—Portuguese possession; on sea-coast. Climate tropical; black population; no cases known (Senn).

Bulawayo.—British rule. Central South Africa, high land, 6,000 ft., dry land. Climate, high tropical. Only twelve cases of malignant disease observed in negroes, two of which were sarcoma. Dr. Curtis reported twelve cases of malignant disease in negroes.

Johannesburg.—British rule; located in Central South Africa, tropical region, inland, but cooled by elevation. Population 210,000, half whites and half blacks. Cancer very rare in blacks, but in Chinese, mulattos, and whites it is not uncommon, and increasing.

Pretoria.—British South Africa; located upon a tableland; mixed population, 25,000. Only six cases of cancer and sarcoma.

Going south, the admixture of white blood is very common, and in officers the disease of the whites more frequent. Dr. Senn did not see a case of carcinoma, appendicitis, tubercular bone disease of the joints, or disease of the lymphatic glands. So far as cancer is concerned Dr. Senn says the whole of Central Africa is immune. Dr. Senn in his report states that cancer is almost an unknown disease in Tropical Africa.

Dr. Livingstone never met with a case of cancer among the Makololo or the Barotse tribes of the Upper Zambesi.

On the *Gold Coast* cancer has been seen but it is very uncommon. In Africa cancer seems to be more uncommon than in any other division of the world.

The mortality is greatest in Switzerland; next comes California, then China, and then England.

Los Angeles has a semi-tropical climate with a warm temperature of 54° F. in winter and the summer mean is 68° F.

San Francisco.—The mean in winter is 57°, and summer 60°. Most of the population of California are domiciled at or near sea-level, say less than 2,000 ft.

In Switzerland they are mostly at high elevation.

In China most of the population live at sea-level.

In England and Wales they are again very little above the level of the sea.

The following chart will enable you to see how difficult a problem it is to determine the influence of a particular climate. For instance, the Faroe Islands, which are or were almost immune, are quite near to countries which have a high rate.

The Egyptians, a very dark-skinned race, are very free from cancer.

Most of the data collected from all countries is from the seacoast, as it is generally the location of the first settlement of a country. The hospitals are generally located there, from whence most of our statistics emanate. It is here where the centres of concentrated population are mostly located that cancer is most prevalent.

When we take the whole world into consideration we cannot say positively that elevation is an important factor. In highlands cancer seems to be most prevalent, shown in Mexico, and Switzerland is a mountainous country and has the highest mortality.

TABULATION SHOWING THE GEOGRAPHICAL DISTRIBUTION OF CANCER.

Immune Districts.

Arabian Plateau.
Central Africa.
Sudanese (Mussulmans).

Districts nearly Immune.

Africa (East).
Australians (Native).
American Indians (in their native state).
Arctic Regions.
Arabia.
Balkan Countries.
Bahama.
Bermuda.
Central America.
East and West Coast of Africa.
Faroe Islands.
Gold Coast.
Guiana.
Greece.
Iceland.
Indian Natives (true cancer rare).
Jamaica.
Mauritius.
Mexican Lowlands.
New Caledonia.
Negroes at Tropics.
Persia.
Turkey.
West Indies (native population).

Low Rate.

Austria.
Argentine Republic.
Belgium.
Brazil.
French (coast).
Irish seashore.
Hungary.
Cape Colony, Africa.
Cuba and Islands.
Italy.
Mexico (highlands).
New Zealand (Australian Islands).
Spain.
Russia.
Turkey.
Uruguay.
Ireland.

High Rate.

Austria (some portion).
Australia, among Europeans and their descendants.
Britain, North.
China.
England and Wales.
France (interior).
Germany.
Holland.
Japan.
Netherlands.
Norway.
Pacific Coast.
Switzerland.
Scotland.
United States, Atlantic Coast.

Causes.

As to the originating cause of this disease we know nothing, but many surmises and theories have been placed before the medical world, but proof is still wanting to substantiate them.

During the last twelve or fifteen years, under the stimulus of endowed laboratories and active scientific labour much has been done in this field and knowledge has been gained which will probably be used in the future to settle the vexed question as to the nature of the cause. Experiments seem to indicate that it is not parasitic as the method of growth, and propagation seem to be unlike those of parasitic growths, and, further, the eyes of so many good observers have looked in vain for an organism.

We do know that climate has an effect in the propagation —that crowding causes its increase and that civilization has the same effect. Beside these three causes we have other influences—overfeeding ; perhaps some forms of food may be influential.

So far as season is concerned, we cannot secure the information that will point out the exact time when the disease starts, as it may take years to bring it to a condition to be recognized, so that season after season may be passed over before the discovery of the disease. If cancer was a disease that promptly exhibited itself by early symptoms we could more easily study its causes.

When we study the influence of elevation we are again forced to the conclusion that nothing is to be learned as far as we now can see, for cities by seashore, or on the mountain, or in the valley, or in the plain, may have the same mortality, and places similarly situated may have different rates of mortality.

It would seem that there is more cancer among the seashore inhabitants, but we must remember that the largest cities

from where most of the data come are crowded localities mostly found on the seashore, on lakes, or on the banks of navigable rivers. There are a few exceptions to this, as Johannesburg in Africa, an elevated plateau, and Switzerland, and a few other locations where mining, or some other industrial interests not connected with navigation attracted a population. The railroads are now taking the place of the water facilities which were formerly almost exclusively used in bygone days.

In Africa, in the city of Johannesburg, the disease is found to be rapidly increasing, much more so than some of the seashore cities of the same country, but we must remember that this city has a large proportion of white—80,000 whites—and 80,000 negroes, 50,000 Chinese, and the city is high enough to produce a temperate climate although in a tropical region.

In sparsely settled districts we find sometimes foci of the disease which seems to point to heredity as a cause, or at least a family tendency to the malady.

Fish has been one of the supposed causes of cancer, probably because the greatest destruction has been in the larger cities where fish are much used as a diet. When we study the history of the disease in the large cities away from the water, such as the city of Johannesburg in South Africa, we find the disease increasing, and yet in such places only preserved fish are eaten by the majority of the population.

The State of New York established a cancer laboratory in Buffalo, New York, and Dr. Gaylord has been investigating the subject in this direction, owing to the fact that fish are prone to have a cancerous disease of the thyroid gland. Dr. Gaylord thinks the trout family is the source of cancer in the human family, and that this fish is the cause. The fact that disproves this idea is that cancer is more common in the cities than in the country, and yet not one in fifty in cities ever taste trout,

while in the country the boys are catching them all summer long, and their families are frequently eating them. Therefore, along the mountain trout streams we should have much cancer, but such is not the case. The North American Indians live largely on trout in the summer, but they rarely have cancer. Again, the greatest number of cities are on the sea-shore, where they eat salt-water fish, other than the trout family, and these towns are the largest sufferers.

In Catholic countries they use more fish in their diet, and yet in Ireland, Spain, and Italy the disease is less rife. It is true the Spanish and Italians are a dark-skinned people, but not so with the Irish.

The subject has attracted the attention of the people to such an extent that President Taft, on April 9, 1910, asked Congress for $50,000 for a laboratory to investigate the subject of fish cancer and its relation to human beings, and to search for a cure of this awful scourge.

Sometimes a whole brood of recently hatched fish has been infected by the introduction of ova from elsewhere, which points to contagion ; and epidemics having occurred among a lot of fish from the same parent, which looks like heredity.

Other articles of diet have been suspected as originating this scourge. Meats of different kinds have been suspected. It has been found that carnivorous birds are more liable to cancer than non-carnivorous, but the non-carnivorous birds are more liable to tubercle.

Savages who eat only fresh or dried meat very rarely have it, while the civilized people eat pickled or salted meats as well as those that are fresh. When we think of the fact that the chimney sweeps have an epitheliomatous disease that is called "chimney-sweeper's cancer," and the "dudeen" smokers from the bogs of Ireland have epithelioma of the lip, it causes us to suspect that smoke may be the probable cause, that creosote or guaiacol might be in the same line with smoked

meats, but no one has noticed any tendency of the taker of creosote or guaiacol to cancer. Perhaps the fact that they have lung disease, or do not live long enough to develop it, or the previous occupation of the ground by tubercle, may have have choked out the cancerous disease.

As we do not know of the definite cause, we must take the next best step, which is to study the conditions which seem to be developing factors, and try to antagonize them.

Dr. Williams states that indications seem to point to the fact that cancer is more prevalent in castrated animals, male and female alike.

Strickers found that 5 per cent. more castrated horses contracted cancer than those who were uncastrated.

Syphilis has been an assigned cause in the past. The natives of the immune districts have chancres, but no cancerous disease follows. Williams found that in 88 cases of cancer of the tongue and mouth 31 had syphilis. In another place it is noted that epitheliomatous cancers follow mucous patches. But again, it is stated that prostitutes are remarkably free from cancer.

Pork has come in for suspicion because the Jews, who have little cancer, do not eat pork; and the fact that pork is largely the diet of the commercial world gives rise to further suspicion. Salt is another article of food that has been suspected as a cause.

Alcoholism has been charged with being a cause, as men are six times more liable to œsophageal cancer than women, but carefully collated statistics disprove this theory. Perhaps smoking may be the cause.

If the cause were *atmospheric*, in all human probability the lungs would be more frequently affected; it does not always affect organs that come in contact with the outside air or any external object, or secretion, as of the uterus of the virgin, spinal cord, brain, testicles, heart, &c. It does not seem to be

a water-borne disease, for observation and statistics prove it does not follow streams.

Cancer is not a *filth disease* or a *poverty disease.* Cleanliness does not seem to have any influence in its production. In Montreal, as shown by their statistics, the rich and poor alike are affected. It has been demonstrated that the poor and rich seem to suffer alike in prosperous towns when food is plentiful. Dr. Gorgas writes in from the Canal Zone that there is no excess of deaths among the poorer classes, and some of the most filthy races have a low mortality or entire immunity. It follows commerce only when associated with crowding.

In *India,* Davidson states that statistics report 30 cases in 5,080 hospital patients treated; he ascribes the frequency of the epitheliomatous form of the disease in Kashmir to the habit which the natives have of carrying a kind of earthern pot with live charcoal in cold weather in proximity to the skin under their loose dresses, and as before stated, we have the Irishman with his clay pipe with a short stem. Here we have the hot pipe-stem causing epithelioma of lip, and the hot pot causes the same disease. In one case the heat in the pipe is moist, while the pot is dry. In seeming contradiction to this theory the hot Tropics are almost immune, as we find that epithelioma is not specially prevalent in the Tropics. Take Africa, for instance; epithelioma is almost an unknown disease, and the same is true of the West India Islands and Central America.

Dr. G. Cooke Adams thinks that the powerful hygienic factors are decomposing foliage in the forests and stagnant water, defective drainage, badly housed and underfed population in cities. He does not think it is due to a parasite or a bacterium. He considers it a constitutional disease due to specific or malignant virus originating in the blood, that it may be acquired congenitally, or by infection or contagion, and that the principal factor is a hereditary tendency. He further believes

that certain kinds of vegetation are capable of rendering immunity to the natives and that syphilis has a relationship and that food has much to do with it. He shows that there is a seeming relationship between food and cause. He further states that the cancer rate in Chicago among the Irish and Germans is the highest in the world.

Another investigator is of the opinion that the poisoning cause is a virus from an earth-worm which crawls over the vegetable, leaving the poison there to be ingested.

Heredity is supposed by most authorities to be a strong factor, and many things prove that it is in the lower animals, as cancer in fishes, before related, and guinea-pigs in the laboratory of the University of Pennsylvania laboratory. If heredity is the only cause, why are the blacks who live in the Tropics free from it, but when they move to the temperate zone begin at once to have it, especially if living in cities? The answer may be that they may have the ante-natal tendency, but do not have the conditions necessary to develop it.

In my practice of forty-five years the four families having the most marked cancer history showing heredity are as follows :—

I saw a patient with the late Dr. Wise who gave the following history. The patient had all the symptoms of abdominal cancer. Four aunts, a brother, and a first cousin had died of abdominal cancer, making seven cases in the family.

In another family, a mother died at the age of 45, and her daughter at 25. The *post mortem* revealed a cancerous mass in both cases at the middle of the ascending colon, both having practically the same appearance and located at the same spot. No other evidences of the disease were found.

A family had a double heredity. Patient, father, mother, father-in-law, and husband, all died of cancer. The children at the time were younger than the usual age for cancer.

Another family, a woman, her sister, a brother, a son, and nephew. In another branch of the same family there were five members who died of tuberculosis in two generations.

Clothing has been suggested as a cause of the development of the disease, but we find that the disease is quite rare in Iceland and Greenland, where they require much clothing, and at the Tropics, where they use little or none.

It has been suggested that a contagious principle in the *soil* or peculiarity in the soil would account for the apparent abundance and continuance in isolated localities, but this seems untenable as the generality of the arguments are against it; the principal one is that the soils in different "cancer spots" are quite unlike. Heredity would seem more likely to be the cause.

The increase being all over the world, it occurred to the writer that it must be something general to affect the whole world if it were due to a germ. Such a germ is that of influenza, and I have looked up the data so far as I have them at hand.

Since the great and virulent pandemic which settled down on us in 1889 and 1890, and has been with us more or less ever since, an opportunity to study its effect upon the mortality is afforded by statistics. Personally, it seemed to me that I had a larger number of cancer cases the next two years, after the virulent onset of the epidemic. They would say, "Doctor, I have never felt well since I had the 'Grippe.'" I have studied statistics, trying to verify or refute the suspicion.

In Scotland, number of deaths in 1,000,000 living inhabitants :—

1861-70	...	416
1871-80	...	486
1881-90	...	578
1891-1900	...	739
1900		800
1901	...	820

In England and Wales, cancer cases in 1889 in 1,000,000 inhabitants :—

1889	...	656
1890	...	676
1891	...	692

In Philadelphia in 1888 the cancer deaths were 4·41 per 10,000

1889	,,	,,	,,	5·10	,,
1890	,,	,,	,,	6·26	,,
1891	,,	,,	,,	5·86	,,

In New York in 1889 the rate as given was 51

1890	,,	,,	,,	57
1891	,,	,,	,,	53

Other examples may be seen of a similar rise in the death-rate a year after the onset of the epidemic, and will be found in the death-rate shown in the geographical study in this paper.

If influenza was the cause, it probably took about a year or more for the cancer to develop, so that the statistics of the deaths of 1891 would in all human probability show an increase, and it so appears. But the next year, when the virulence had abated, the rate seemed to come down to the ratio of the previous year.

In regard to influenza it is, I think, worth studying as a cause, for the increase seemed to be greater, following it about in the years 1890 and 1891. It may be that the cause was the microbe developing a poison which was the initial cause.

The rate seemed to go up the year after the epidemic and slumped again the year after. But we should not lose sight of the fact that in almost all exhausting diseases the end was hastened by the great depression which followed the influenza onset.

Dr. Williams, who has given much attention to the subject of the cause of this disease, says that he thinks that *alimentation* plays an important part in the incidence of cancer. He also adds later that nutrition is also a factor.

Hailes says it would also seem that domestication seems to start the disease in animals. This has been especially noticed

in dogs and monkeys. Savages and others living a life close to Nature like the monkeys are not generally affected.

As soon as the white man changes his way of living tumours of all kind seem to appear or gradually increase. That the animals are affected as well as man seems to do away with the idea that syphilis is a cause. The transplantation of the negro from Africa to America has been followed by an increase in malignant disease, but to a less extent than the whites, and the increase, Williams thinks, is caused by gluttony and laziness. The same may be said of the North American Indian, but to a less extent.

The immunity of the Jews is thought to be less, as has been shown by J. H. Billings, Billroth, and others in the United States and Austria. One London physician has studied the mortality of Jews in that city, and said that they were only one-half as liable as the rest of the population.

I have seen six cases of cancer of the mouth and throat, tongue and mouth, two male and one female in the throat, one of the cheek and two of the tongue in non- or moderate cigar smokers with a syphilitic history. The cancer developed before middle life or a little later.[1]

I recall a case in a woman where a cancer developed in the cicatrix of an opening in the abdominal wall over the gall-bladder through which twenty-seven gall-stones had passed. The opening promptly closed, and fifteen years later the cancer appeared. Another case was an old soldier who developed cancer in the abdominal walls in a scar where he had been shot twenty-seven years previously. An autopsy developed the presence of a large conical ball which he had carried all these years.

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[1] Since writing the above I have read an editorial in the *Journ. Amer. Med. Assoc.*, on carcinoma, which states "that Brandt, of Berlin, says that it is not uncommon to find carcinoma arising from the base of a syphilitic ulcer; and Koerner, of London, has seen at least twelve such undoubted cases in the tongue."

An old soldier who was very tall, was the flag-bearer of a post of the Grand Army of the Republic. The end of the pole was carried in a socket which was supported around his neck. As he marched the pole pressed and knocked against his epigastrium. For years the part was always quite sore after a march. A cancer developed at the point against which the flag pole rested and bruised.

A young man was struck in the abdomen by a batted ball, and at the point a cancer made its appearance. We know that prolonged irritation may sometimes cause a localization of this disease.

Race.

Williams says : " I have never met with and cannot cite a single instance of a malignant disease in an albino."

"Among the Scandinavian and North European people, who are mainly blonde, the disease is very common." "The Italians and South Europeans are predominantly dark (70 per cent.), and their cancer mortality is much below the usual average."

Cancer and Graves's Disease Compared.

It seems to me that the cause of cancer is very like that of exophthalmic goitre ; it is hereditary, and it is developed under favourable conditions ; otherwise the tendency remains quiescent. The causes of goitre development may be food, crowding, childbirth, fright, anæmia, certain geological area and mineral waters, and an elevated residence may exert an influence in those having an ante-natal tendency.

A study of the subject may lead us to the conclusion that this disease is one that is very like Graves's disease, in that it is hereditary, and that conditions may develop it, such as crowding together, with climate conditions, race, food, just as a limestone district and an elevated home seem to develop Graves's disease. In general, it is found that Graves's disease

is exceedingly rare in the negro. I have met with but one case in the black race.

Race, Colour, and Immunity.

The question of the degree of immunity of the negro and Indian races is difficult to determine as the statistics are incomplete, and in the West Indies, Mexico, and Central America they are so blended with the Carib Indians, the original inhabitants, that it is difficult to get at the full truth.

The other moderately dark-skinned races, such as the Spanish, Italian, Portuguese, Filipinos, and Japanese, and others of the class seem to resist the tendency shown in the races with blonde skin.

Another fact proved by observation is that the dark-skinned people all over the world are less liable to it. The black less than the less dark people such as Spaniards, Italians, &c., are less liable to the disease. All these dark races when mixed with the white lose their immunity. It is found that along the shore of the Mediterranean, including the seacoast of Portugal, Italy, Eastern Sicily, and Sardinia, the death-rate is much less than in France, England, Wales and Scotland.

These people become more liable to cancer when they reach our shores and live in cities, but not to the extent to which it occurs among the white-skinned people from England, Sweden, Norway, and Denmark.

Climate is to be considered, for in the Tropics the whites from the temperate regions are more liable than the blacks, yet they are more immune than when in temperate regions.

Race, independent of climate, has a marked influence upon this disease, for we find that the blacks in the Tropics who are nearly immune when they migrated to a northern climate have more of it, but never to the extent that it is found in the whites.

Comparison of Cancer and Tuberculosis.

Cancer is increased by climate.	Tuberculosis is increased by climate
Cancer is most common in temperate regions.	Tuberculosis quite general in its distribution.
Cancer a disease of civilization.	Tuberculosis a disease of civilization.
Cancer a disease of crowding.	Tuberculosis is a disease of crowding.
Cancer a disease of all classes, the rich and poor generally suffering alike.	Tuberculosis found more among the poor.
Cancer not a disease of filth and squalor.	Tuberculosis is advanced largely by filth and squalor.
Cancer most among the well fed.	Tuberculosis among ill-fed population.
Cancer among the strong.	Tuberculosis among the weaklings.
Cancer, mostly uterine, mammary, and gastric.	Tuberculosis generally affects the lungs.
Cancer not generally supposed to be parasitic.	Tuberculosis caused by a bacillus.
When cancer increases.	Tuberculosis generally decreases.
Cancer is a disease of advanced life.	Tuberculosis a disease of youth, or early middle life.
Cancer is a disease that is on the increase.	Tuberculosis a disease that is rather on the decline.

Williams, Thompson, and others have decided by statistics that tuberculosis is more common in cancerous families than in others. Dr. Williams says: "Long study of the family history of cancer patients has convinced me that most of the latter are surviving members of tubercular families." Statistics have apparently shown that lunacy and idiocy are more common in tubercular and cancerous families.

Cancer is said by some to be inoculable, contagious, or infectious, not positively demonstrated.

Tuberculosis is, perhaps, inoculable; if not contagious it is infectious.

Cancer not cured by change of climate, including pure air, sunlight, and diet.

One or the other of these causes of death are increasing with the modern changes in living, crowding, mental

perturbation, food, clothing, come in for a fair amount of suspicion outside of heredity and infection, contagious and parasitic causes.

Food as a Cause.

Dr. Williams states that "where cancer is rife tuberculosis is rare, and where tuberculosis is common cancer is at the minimum." This is explained by Dr. Williams thus: tuberculosis follows scanty food, while cancer is plentiful among the over-fed.

Dr. John A. McGlinn, of Philadelphia, has looked over the *post-mortem* records of the Philadelphia General Hospital and reports the following findings:—

Total *post mortems*, 9,000.

Total cancer cases, 457.

Found healed pulmonary tuberculosis in cancer cases 53 times.

Found miliary tuberculosis of lungs in cancer cases 10 times.

Found acute pulmonary tuberculosis in cancer cases 8 times.

Found tuberculosis of intestines in cancer cases 6 times.

Found syphilis in cancer cases 5 times.

Increase.

Statistics from all parts of the world that have accurate yearly records indicate that the disease is on the increase. It must be remembered that the statistics come generally from commercial countries as they are the most populated districts, are near the sea, or along navigable rivers, while the interior of the countries recently opened to civilization have no available data. This increasing mortality is found in all the divisions of the civilized world.

Increase in United States Cities.

The Health Department of Baltimore Reports states :—

Death-rate,	1903	...	0·583 per 1,000
,,	1904	..	0·693 ,,
,,	1905	...	0·683 ,,
,,	1906	...	0·702 ,,
,,	1907	...	0·707 ,,
,,	1908	...	0·722 ,,

Coloured death-rate has increased per 1,000 from 0·317 to 0·648, while the white increased from 0·632 to 0·736.

Philadelphia Health Department cancer and malignant tumour rate :—

1880	...	4·34 per 1,000
1890	...	5·13 ,,
1900	...	6·26 ,,
1908	.	8·06 ,,

The Boston Health Department Reports indicate that the deaths from cancer per 10,000 as compared with the total deaths :—

1840	..	2·02 in 10,000
1850	..	2·12 ,,
1870	..	4·43 ,,
1880	...	6·31 ,,
1890	...	7·27 ,,
1900	...	8·06 ,,
1908	...	10·18 ,,

Cuba.—Dr. John Guiteras reports that there is a general increase in the deaths from cancer :—

Population in 1899	..	1,572,797	...	Deaths in 1900	...	428
,, 1907	...	2,048,980	...	,, 1907	...	813

New York decimal rate :—

1870	...	·67
1880	...	·84
1890	...	1·16
1907	...	1·39

Boston statistics :—

Rate per 10,000 inhabitants	1860	...	4·34
,, ,, ,, ...	1880	...	6·31
,, ,, ,, ...	1890	..	7·27
,, ,, ,, . .	1930	...	8·08
,, ,, ,, ...	1908	...	10·18
Estimated population			617,075
Census, 1905			595,380
Deaths			11,776
From cancer and other malignant tumours			628
Total, 1908			11,776

Nativity of dead cancer patients :—

United States	273
Ireland	156
England . .	24
Scotland . .	6
Germany	28
British America .	67
Italy	15
Russia	26
Sweden	6

Deaths per 1,000 inhabitants, 1·018

In Boston they give the nativity of the parentage so far as known.

The deaths in *San Francisco* from all malignant tumours :—

1907 ...	257
1909 ...	409

There would seem to be a great increase, as the deaths have nearly doubled, while the population certainly has not correspondingly increased.

London,	1861 ..	40
,,	1881 .	68
,,	1901 .	88
,,	1905 .	93
Paris,	1870 ...	91
,,	1880	94
..	1890	108
..	1900 .	120

(See the letter of Dr. Ward quoted in this paper which gives you the statistics of the City of Montreal, which indicates that cancer is on the increase in that part of Canada.)

Conclusions.

(1) It is most common in temperate regions.

(2) It is found in all latitudes.

(3) It is found in moist climates and dry climates.

(4) It is not confined to highlands or lowlands, seashore and mountain.

(5) It is not limited to any soil, or any geological formation.

(6) It is found by fresh water and by the sea.

(7) It does not follow streams of water.

(8) It is increasing in every civilized country, therefore it follows civilization.

(9) It is more or less prevalent in all countries, but rare in the Tropics or cold regions.

(10) It is found in almost all races, but less common among the dark-skinned races.

(11) As the population becomes more dense it becomes more prevalent.

(12) It is found among the rich and the poor.

(13) It is more common among the well fed than in the poorly fed.

(14) It seems to be largely due to an inherited predisposition.

(15) Those living close to Nature with a simple and often scant diet and outdoor life are largely immune.

Cancer has been called "the demon of civilization." After studying the subject it seems to me that the theory of Dr. W. Roger Williams is nearer correct than any other—that it is largely developed, if not caused by over-feeding, or rather over-nutrition.

I have been impressed with the similarity of the effect of climate upon cancer and insanity, tuberculosis and suicide, in that it increases with civilization, and with increased density of population, most in temperate zones, less toward the Equator and Poles. As many suicides are insane when they commit the act, the influence of a cancerous heredity leading to insanity may perhaps be the cause in some cases of suicide.

If the data that I have been gathering together in this direction will only assist in the discovery of the cause or a remedy which may diminish this awful disease, I will be thankful and feel that my labour has not been in vain.

When civilization is viewed from the standpoint of cancer,

suicide, insanity, and tuberculosis, the question naturally arises, Is civilization with its dangers as great a boon as it is generally supposed to be; is it worth while and does it pay?

DISCUSSION.

Dr. C. L. MINOR (of Asheville): I am unable to discuss Dr. Curtin's interesting paper, but would like to say something as to Dr. Darlington's remarks on vital statistics. Speaking for the south and those sections where the negro greatly predominates, I am satisfied that vital statistics are utterly impossible. As to whether there are many cancers among the negroes or not remains to be proven, but I am sure that of any there may be, only a minute fraction would be reported. A large majority of all negroes, and especially of country negroes, have no doctor, or such doctors as would never report. But leaving the negro aside, statistics of disease in the rural whites living, as they often do, miles from the nearest doctor, and miles from the registering office, are out of the question. In the thickly settled country with many officials and people trained to carry out registry law it is different. But for the portions of our country which are purely agricultural and where anything but villages are rare, we need not anticipate statistics which would be of any value.

DISCUSSION OF PAPERS BY DR. F. FREMONT SMITH, DR. H. L. ELSNER, AND DR. JUDSON DALAND AND DR. W. DUFFIELD ROBINSON.[1]

Dr. HALL (of Denver, Col.): The case I wish to speak of is much more impressive to me than any reports of laboratory experimentation could be. I saw some six years ago a physician, then 34 years of age, who had suddenly developed attacks of asthma following whooping-cough. He had been treated in Chicago, Liverpool, and London for his asthma, and finally came to Colorado, hoping for relief, but the climate gave him no help. I suggested that he try a hypodermic of adrenalin solution. He did not wish to try it, but finally did. It gave him the first ten minutes of absolute relief from asthma that he had had for years. Since that time he has used 200 oz. in the course of six years of 1 to 1,000 solution of adrenalin. The man would never go down town without two hypodermics in his pocket for fear of one breaking. He has at times taken sixty hypodermics in twenty-four hours, and probably about 20,000 in the six years. I had occasion to examine him a month ago and went over his arteries. They are soft, his blood tension was 132 mm. entirely within the normal limits. I asked one or two other clinicians to examine his arteries and they found them absolutely normal. I asked Dr. Stevens, one of our best ophthalmologists, to examine his retinal arteries to see if there was any indications of sclerosis from the use of the adrenalin. There were none. He has finally recovered from his asthma and gained 77½ lb., weighs 190 lb. now, and is ready for the practice of medicine. I wish to say very briefly that I certainly agree with the doctor that tobacco has a marked influence upon the heart. I think I can tell the time of the year when May comes because of the number of teachers who come in all tired out. In the same way I can tell when a financial panic is pending by the number of men who are in heavy business who get anxious about the situation and smoke, the kind of men who smoke fifteen or twenty cigars in a day and then wonder why the heart is affected. One man whom I knew lost two million dollars, and his heart dilated until it was 2 in. to the left of the left nipple. By cutting off his tobacco, and the clearing up of the panic, and his final resignation to the loss he had suffered, and a treatment at Carlsbad, he was finally restored. Osler says that angina pectoris is common among doctors; I have not yet known any doctor to have had it over the loss of two million dollars in a panic.

Dr. J. M. ANDERS (of Philadelphia, Pa.): Dr. F. Fremont-Smith included under the title of infective endocarditis only ulcerative endocarditis.

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[1] See pp. 138 and 158.

On the other hand, certain writers are in the habit of including under the same caption both forms of acute endocarditis. It seems to me that we are sadly in need of a classification that should be universally adopted. During childhood ulcerative endocarditis is more often associated with acute articular rheumatism than any of the other infective disease of early life, but I do not recall that Dr. Fremont-Smith stated what were the primary affections in his cases. There is a surgical group of cases due to bone diseases, to skin infections, and particularly osteomyelitis, which group is not uncommon in young subjects, and I am sure, from personal observations, is frequently overlooked. Dr. Smith's cases belong to that group known as "recurrent ulcerative endocarditis," perhaps the least difficult of all forms to diagnose. Again, in a case of chronic endocarditis the development of a septic condition, even in the absence of a septic focus elsewhere in the body, justifies the clinician in making a clinical diagnosis of ulcerative endocarditis. The cases in which the cardiac signs are unusually prominent are the most readily recognized, but in my experience these cardiac signs are most indefinite, as a rule, and, while we hear much about the change in the character of the murmurs due to chronic endocarditis, I have been struck by the fact that more commonly than a noticeable change in the character of the murmur there is present a moderate degree of secondary dilatation of the left ventricle. I think this is a point that is probably often overlooked. I was glad to hear Dr. Elsner lay down that important clinical truth that hypertension is not the sole cause of angina pectoris, but, on the other hand, cases of hypotension may manifest this dangerous condition. He spoke of the case of hypertension that could not readily be relieved by treatment, and said that cases of that sort were to be regarded as instances of hypertension due to arteriosclerosis. This is true, provided that the treatment employed is entirely appropriate, but as he so well said, unless one gives massive doses of nitro-glycerine or other arterial relaxants, in many of these cases the arterial spasm is not relieved, and then we are apt to confuse an arterial spasm with high tension due to arterial changes. Of this I have seen a number of illustrations.

A word with reference to the influence of tobacco as a causative factor in angina pectoris. I quite agree with Drs. Daland and Robinson that it may be, though rarely, the principal factor in bringing about this grave condition; but without exception, in my experience, the cases in which it has seemed to stand in an etiologic relation, other causative agencies have been at work and easily recognizable. For example, a man suffering from aortic incompetency developed angina pectoris after smoking strong cigars, and quite recently a case of arteriosclerosis of moderate degree, associated with marked arterial spasm, fell under my observation, and in that case the use of strong cigars seemed to excite an attack of angina pectoris; at all events treatment by rest, removal of the weed, and the use of small doses of nitro-glycerine led to a practical cure. We all know, as has been said by Dr. Elsner, that tobacco rapidly raises the arterial tension. It does so

by inducing spasm of the arteries, and, as the result of my observations extending over many years, I believe that this is the most important influence of tobacco. I am aware that certain writers contend that nicotine produces widespread degeneration of the aorta in animals, and that it causes arteriosclerosis of the coronaries. I have never seen a case of coronary disease that I could attribute solely to the use of tobacco. I have, however, as Dr. Curtin has so well said, seen many cases of rather marked arrhythmia, with acclerated action of the heart, due to smoking, but this is an entirely different condition from true coronary disease, because the removal of the tobacco in these cases is invariably followed by a normal pulse-rate, and the disappearance of the arrhythmia.

Dr. H. L. Elsner (of Syracuse, N.Y.): It is important to give to the use of tobacco its proper place as a pathogenic factor in the subject under consideration. I am sure that cases in which there is a strong hereditary tendency are influenced by tobacco. With all patients suffering from angina we must study the tendencies and antecedents; in other words, the individual is to be treated. The cases reported by Dr. Daland seem to me to show marked hereditary and baneful tendencies. The study of family history as related to angina pectoris is of the greatest interest, and unearths many factors which have decided influences in such cases as Dr. Daland presents. It is exceedingly difficult to prove that tobacco is provocative of angina, but we do know that many patients who suffer from the disease get better when tobacco is discontinued. The X-ray demonstration which Dr. Daland present are of great value; we should use it more in these cases; it often brings light where, without it, we would remain in the dark. With regard to the frequency of angina in women, I would say our statistics in Central New York prove it to be of very rare occurrence. As I recall my statistics mentioned in the paper there were but three or four women afflicted. Women bear angina pectoris longer because they are better able to relax than men, are not burdened with such weighty responsibilities, rest more, and in every way we find them more tractable under treatment. Now with regard to the good Bishop's experience mentioned by Dr. Curtin, we must grant that there is in angina a large psychic element. I have notes of a miller who never had an attack in his mill however hard he worked, though going to all parts of it many times daily, but the moment he walked outside of the mill against the wind or up hill, or exerted himself in any way, particularly after eating, he suffered the pangs of the disease. I have the notes of a case of one of our professional colleagues who finds that when he walks alone he is more likely to suffer from angina than when he walks with others, this is more particularly true when walking with his professional brethren. Angina is not always associated with fear of impending death. With regard to the aortic second accentuation, it may be said with positiveness that the majority of patients with hypertension present this physical sign. As Sir Lauder Brunton has said, "The door is slammed." This is likely to be the case when the aortic cusps are closed

after the heart has made the attempt to overcome the obstruction in the periphery.

Dr. DALAND: As angina is merely a syndrome, it has many causes, and the object of this paper is to point out that Case 1 presents clinical evidence tending to show that tobacco was the sole cause, and that in Cases 2, 3, and 4, all relatives, presented multiple causes, but that tobacco seemed to be the chief cause. The absence of angina in the sister, who never used tobacco, tends to support this view. The cases reported are not to be confused with the neuralgias that are so frequently met with among those using tobacco to excess. I agree with Dr. Elsner as to the therapeutic importance of sleep in hypertension and arteriosclerosis. Certain cases of hypertension, due to toxic causes, as, for example, uræmia, have resisted all therapeutic efforts, excepting those directed towards the removal of the poison by measures such as the hot-air bath, &c. In these toxic cases I have, unfortunately, not been able to secure marked permanent benefit from nitro-glycerine and the nitrites, in attempting to lower high blood-pressure.

Dr. JOHN H. LOWMAN (of Cleveland, Ohio): I wish to call attention to a prognostic symptom of some value in arterial tonus. When the hypertension is continuous there is danger; but when you can demonstrate that there is a time when the tension is low, and, in consequence thereof, there is opportunity for compensation, you have evidence which has prognostic value. A man may have a blood-pressure of 220 mm. during the day, and a pressure of 135 mm. at 5 o'clock in the morning. I have been able to demonstrate this in several instances in simple cases where there was no physical evidence of any allied disease, such as the people to whom the Doctor has referred, and who are apparently increasing in number. That they are more numerous is not certain; we do, however, now diagnose them more readily and more often. A patient may be in your office with angina. You find an increase in the arterial tension. Such a patient should be seen in the morning, during sleep if possible, and the measure of the blood-pressure taken. I recall a specific instance of a lady who said she was losing her ability to work—that is, she was an ordinary housekeeper, but she was not equal to her duties and tired easily. People said there was nothing the matter with her. She had a blood-pressure of 220 mm. I saw her at five in the morning, and took the pressure, which was 120 mm. Then I made a favourable prognosis that she would yield to the action of nitroglycerine, and this she did, and after a very short time her pressure was 135 mm. In hypertension with nephritis the pressure will be high in the morning. I recall four cases where the pressure was higher in the morning than it was during the day, and the prognosis was therefore unfavourable. There was no time in which there could be compensation; no time for several hours during the day when there could be a flushing of the capillaries and a re-establishment of the system. A patient has a chance of temporary recovery, and will live very much longer if he will submit to the action of

nitro-glycerine. If a patient with a single hypertension who has a fall of tension in the morning, is willing to submit to the nitro-glycerine, send him to the hospital, give him the nitro-glycerine—one drop of a 1 per cent. solution every ten minutes—until he feels some flushing in the head. Such a person with a simple hypertension we would subject to the experiment in order to see what his dose is, whether one, two, three drops, or more, and you have, then, some guide as to the quantity he can take. If it, however, is a nephritis case, you will not be able to reduce the tension with nitro-glycerine; but if it is a simple case you may. Of course this is only one thing in these particular patients—it is simply a symptom. There may be very many different cases, but I am reasoning directly on one point. There may be some remote focus. I happened to see a case of tuberculosis recently with a tension of 220. Tuberculosis generally has a very low tension. The cause of the hypertonus was not apparent, but nitro-glycerine removed it. Of course, there may be some cases which you cannot control, but as far as the symptom of the morning decline is concerned, it is an admirable sign. The particular point that I arose to make was that there is more compensatory power in the hypertonic individual when there is a long period of low tension, and if one can demonstrate that such periods exist, the prognosis is more favourable.

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